

# POPULAR MECHANICS

Oct. 1966  
35 CENTS

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from DAN GURNEY



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Mercury's New COUGAR

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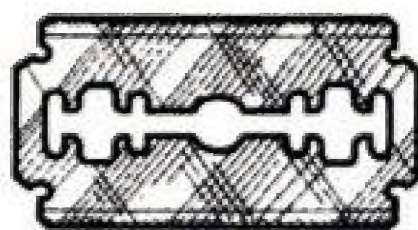
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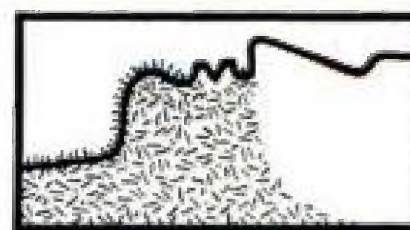
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**Dan Gurney Tests the Camaro.** Read what this famous racing driver has to say about Chevy's newest entry in the hot car field.



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"When a booklet arrived describing the Plans, I realized that if I started right then—at 40—I'd be able to retire in only 15 years with \$300 a month. It was the perfect solution for me.

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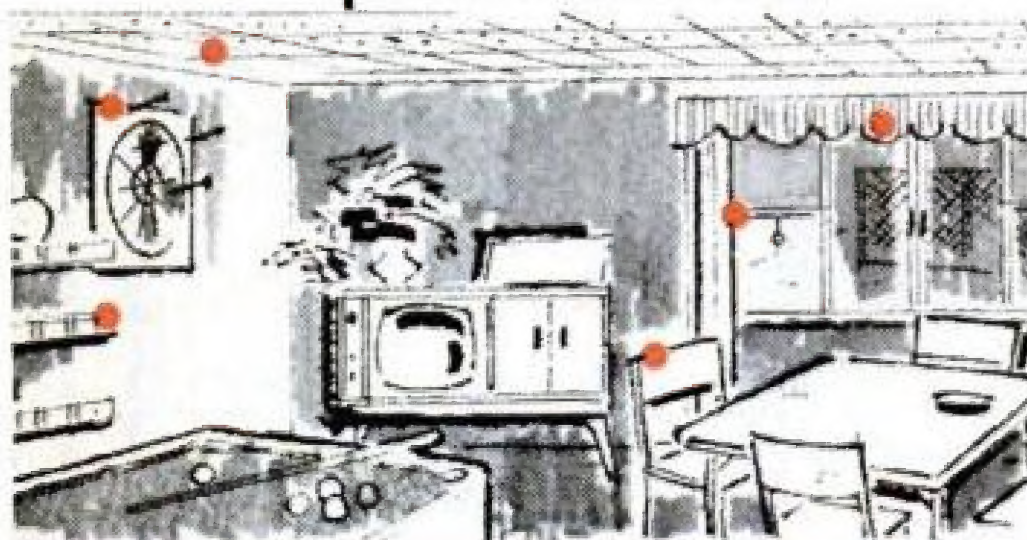
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# LETTERS TO THE EDITOR

## His cup of tea

I am 15 years old, and I built the Tea-cup (page 146, Jan. PM).

I made several changes in the plans, the most basic being the sail, mast, boom and rudder which I purchased as part of a set



made by Starcraft. The mast height is 14 feet and boom length, 7 feet. I also fiberglassed the hull—which added very little to the total cost of the project.

It turned out surprisingly well, considering that I worked on it only on Saturdays and after school.

Peru, Ind.

RAY PRIBLE

*Just think what you could build, Ray, if you didn't bother going to school.*

## Lethal needles

The *News from the Military* article on wire bullets (page 24, July PM) seemed familiar. After a bit of research, I discovered that such bullets are not exactly a new invention.

According to a reference book I have, a somewhat similar weapon, though much larger, was used in the Boer War. The weapon was a Maxim 37-mm automatic cannon firing one-pound explosive shells from belts of 25. This weapon could be

*(Please turn to page 8)*





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Occupation.....Working Hours.....A.M.....P.M.





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## LETTERS

(Continued from page 6)

used to fire special clusters of steel needles bound together with lead bands in place of the shells. In operation, the lead bands were severed by a special cutter attached to the muzzle, allowing the steel needles to spray over a wide area with a lethal effect. Such clusters, coupled with the weapon's high rate of fire, made the Maxim a highly effective close-quarters weapon. The principle is apparently still a valid one.

Sierra Vista, Ariz. DANIEL VUKOBRATOVICH

### Surrey from a car

In 1963 I started to build the *Sidewalk Classic* car (page 146, Nov. '63 PM). I completed the front axle assembly and bought the wheels—and these remained in my basement until last fall when I got the idea for the surrey.

The original front axle was used, except that I put  $\frac{3}{16}$ -inch steering arms and ball joints in place of the parts called for



in the plans. The seat arms, posts and top framework are all made of half-inch thin-wall conduit; sailcloth was used for the top.

The tops of the seats are hinged, and the passengers use the space to store their toys while they are riding.

At times, some of the pulling power comes from neighborhood children, but most of the time I pull it with a small riding tractor.

Euclid, Ohio

KENNETH ORME

You've turned a horseless carriage into a plain carriage. It isn't progress—but it looks great.



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BY JOHN F. PEARSON  
**SCIENCE**  
WORLDWIDE

**Kiss of death.** That's what a "welcome home" buss could be for an astronaut returning from an extended space voyage. So says the University of Missouri's Dr. T. D. Luckey, who explains that sterile food and the sterile environment of a space capsule would greatly reduce the number and variety of bacteria in the astronaut's body. On return, he could fall victim to bacteria that normally are innocuous because he has none to fight them.

**Madness in writing.** Russian scientists say they've invented a machine that can help to diagnose mental diseases by analyzing writing. As the patient writes, the device records tensions, velocity and peculiarities of his hand movements.

**Looking for a boost** from that second cup of coffee? According to researchers at the University of Michigan, you might do better to wait a while. They say the caffeine in the first cup stimulates you but also partially blocks any additional stimulus from caffeine for better than two hours. It takes only about 20 minutes for the first cup to perk you up.

**Man-made island for Arctic waters** is planned by the National Science Foundation to provide a base for research in biology, oceanography, physics, glaciology and entomology. Big enough to hold 45 scientists and crewmen and strong enough to withstand icepack stresses, the drift barge would carry enough fuel and food for several years.

Its facilities would include a helicopter pad and a hangar for small fixed-wing aircraft. NSF hopes to have such a barge in action by the early '70s.

**New job for the helicopter.** In the rugged mountain area of Utah choppers are being used to reel out heavy mesh fencing to keep loose rocks from falling on Route 80-N. The mesh "fences in" rock on the face of sheer cliffs next to the highway.

**Longest undersea tunnel in the world** will be built to connect the islands of Honshu and Hokkaido in northern Japan, according to Japanese National Railways. The 22½-mile railway tunnel will cut by about six hours the travel time between Tokyo and Hokkaido. (But the "cham-

pionship" will move to Europe if and when the proposed English Channel tunnel is built to link England and France. It may have an overall length of 32 miles, with 23 miles underwater.)

**Which way, mate?** A giant turn signal is a feature of the *Moerdyk*, new Holland-America Line freighter. The indicator is a 19-foot-long steel arrow pointed at each end and attached to the foremast. It is illuminated by a row of lights. When the ship intends to change course, one end of the arrow lights to indicate the direction.

**Do trees get cold** when the temperature drops? Not deep inside, according to the findings of Australian botanists. In recent tests, it was found that a change of 22° C. at the outside of an average-sized tree caused a mere 1° change at its center. In the tests, thermocouple wires were fitted into grooves in wooden dowels and inserted into holes bored in the living tree.


**Spot 1 safety device** has been incorporated into Japan's new atomic power station because of the constant threat of earthquakes in that country. Should ground movement distort the reactor casing and make it impossible to lower the conventional boron steel rods for damping down the reactor, a series of 44 hoppers will drop some 4 million boron steel balls into the core. Seismographs located near the reactor have been provided with preset values which, if exceeded, trigger a shutdown.

**Bounce is what we like about rubber**, but it also makes it hard to work with. Cutting rubber parts, for example, is a slow and imprecise operation. But now tests at the University of Illinois show rubber can be machined as easily as metal if it is cooled to supercold temperatures.

**Kill roaches with boric acid**, advises Dr. Walter Ebeling, UCLA authority on household insect pests. He reports that tests have proved the familiar white powder to be more effective than the most powerful chemical insecticides.

Key to boric acid's potency is that it has no repellent effect on the bugs, as have most prepared insecticides. Roaches, says Dr. Ebeling, learn to stay away from repellent insecticides.





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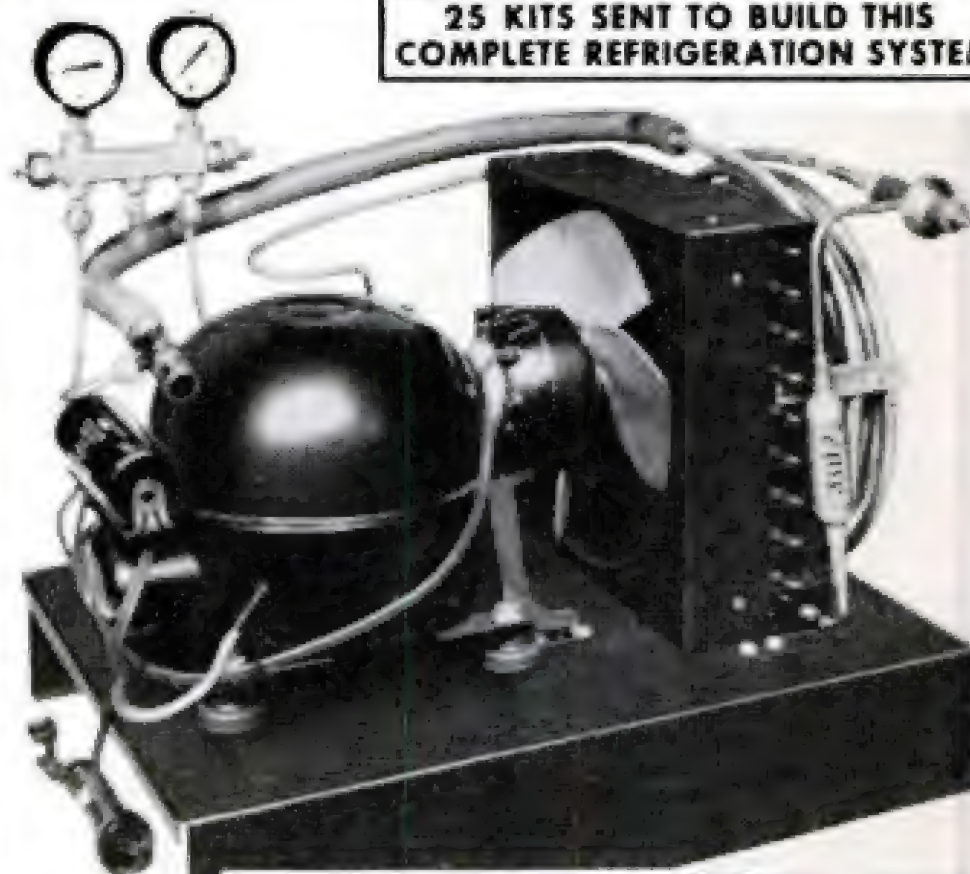
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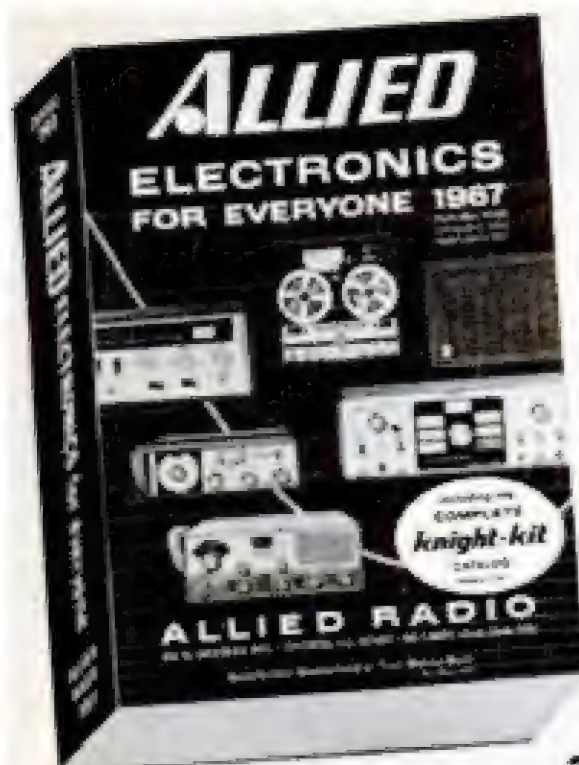
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15737-B

# NEWS FROM THE **MILITARY**

BY WILLIAM R. KREH

**A cool ceramic** has been developed by the Air Force which promises excellent heat protection for the outer surfaces of aircraft and space vehicles. Called "Zircolite," the material has been tested continuously for 260 hours at 4000° F. without any measurable deterioration.

**Floating smoke.** So much water in the delta area of South Vietnam presents many problems, one of the more serious of which was the inability of signaling aircraft with a standard smoke grenade. With nothing but water to land in, the grenades could not burn. To overcome this, the Army has developed an attachment for the grenade which allows it to float. A metal shroud is slipped over the grenade which is activated by the heat and pressure of the smoke and forces it to slide up on the grenade, thus making a watertight air chamber which holds the top of the burning grenade above water.

**Battery-powered pistol.** A five-year forecast prepared for the Army predicts that production experts must be prepared to turn out an electrically-powered pistol within the next five years. "It is anticipated," the unclassified document says, "that there will be a sidearm microballistic weapon that will be electrically fired from a low-voltage battery (1.50 volts)."

**No-leak spacecraft.** A self-sealing, quick-hardening material designed to plug holes punched in space vehicles by micrometeorites is being developed by the Air Force. Packets of the "instant repair" rubber, in liquid form, will be inserted in the walls of a spacecraft. When the craft's skin is punctured by a micrometeorite, the rubber will instantly fill the hole and harden.

**"Mighty-Mite"** is doing its job in Vietnam, Army officials report. Otherwise known as the M-106 riot-control-agent dispenser, Mighty-Mite was adapted from a commercial agricultural sprayer. The 32-pound blower is used to force tear gas into tunnels, caves and other enemy hiding places in Vietnam. Also in the Army's chemical arsenal in Vietnam is "Pop Gun." Used for surface-to-surface application of riot control gas, the 35-mm gun fires 16 pyrotechnic-agent canisters in four volleys to produce a rapid accumulation of tear gas over a large target area.



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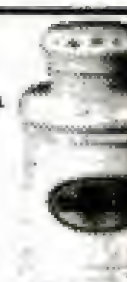
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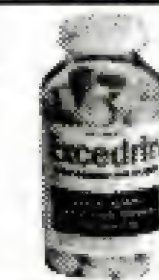
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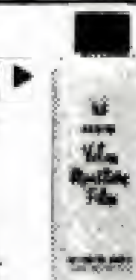
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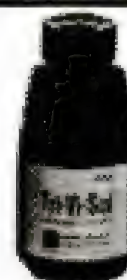
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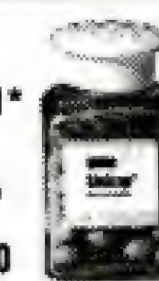
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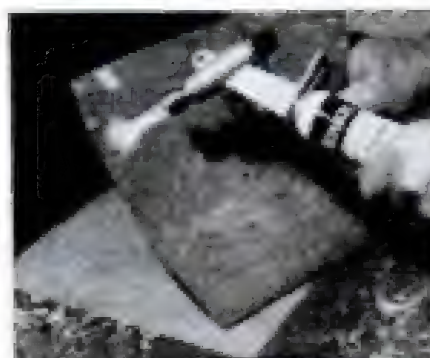
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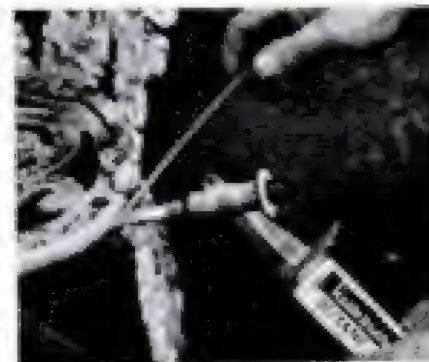
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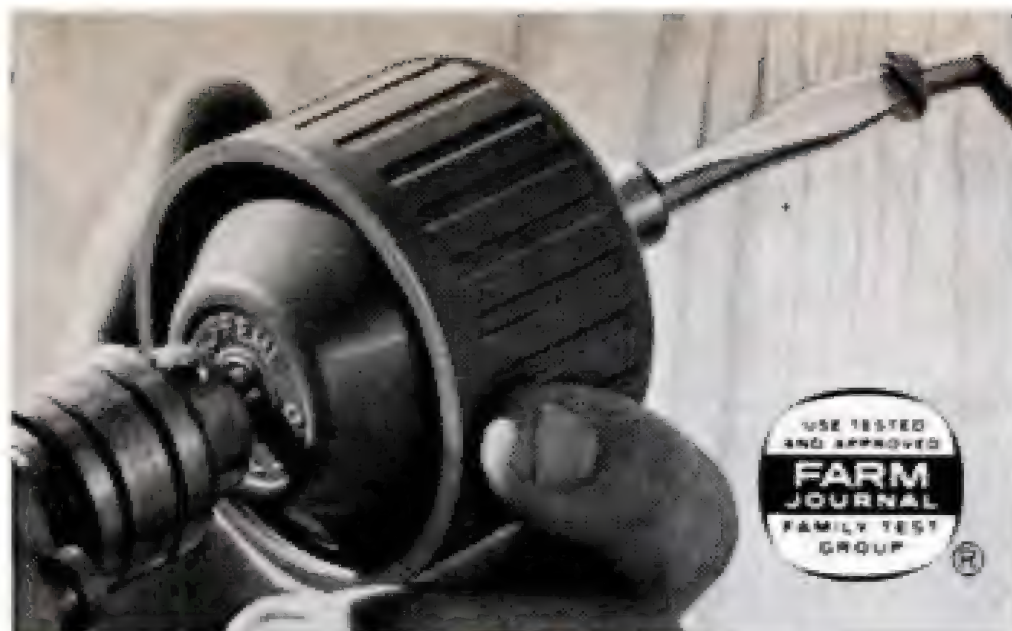
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BY KEVIN V. BROWN  
**AVIATION**  
JETSTREAM

**Wankel engines in airplanes?** Well, they're talking about it. Some few experimental aircraft, and even production models, are using Volkswagen engines, and at least one plane was flown with a V8 engine right out of an American compact car. Wankels might be next.

The new rotary piston engine has only half the number of parts and occupies one-third the space of a comparably powered piston engine, and consumes a fraction of the fuel needed by a comparable turbine. The savings of weight, space and economy might be enough to convince some backyard builder or even one of the commercial manufacturers to try it on for size.

**Portable aircars** that you can store in the trunk of your car and inflate in the field are being developed in Britain.

Powered by two wheelchair engines, each car is designed to carry seven men at speeds up to 35 mph. In tests a machine has traveled over asphalt and rough grass, and even over parked cars and people without harming the craft or the people.

The new ground-effect machine is being developed by the British Ministry of Aviation for possible paradrops into jungles, swamps and other remote areas cut off from roads.

**Instant landing pads** that can be sprayed on and support 15-ton VTOL aircraft within an hour have been demonstrated successfully.

The base of the pad consists of glass-fiber cloth, on which is sprayed a solution of glass-fiber roving and a liquid resin to a thickness of one-quarter inch. The mixture cures within an hour and has supported helicopters, jet-powered VTOLs and the new XC-142 tilt-wing transport.

**Arresting cables** to prevent overruns on military and commercial airfields are being tested by the Air Force. Electrical pulses, generated by the main wheels rolling over switches mounted flush in the runway, send signals to the cable which is shot upward by compressed air, catching the main gear.

The cable is located in a trough 950 feet from the end of the paved overrun. It would snag aircraft during emergency landings, on slick runways or during aborted takeoffs.



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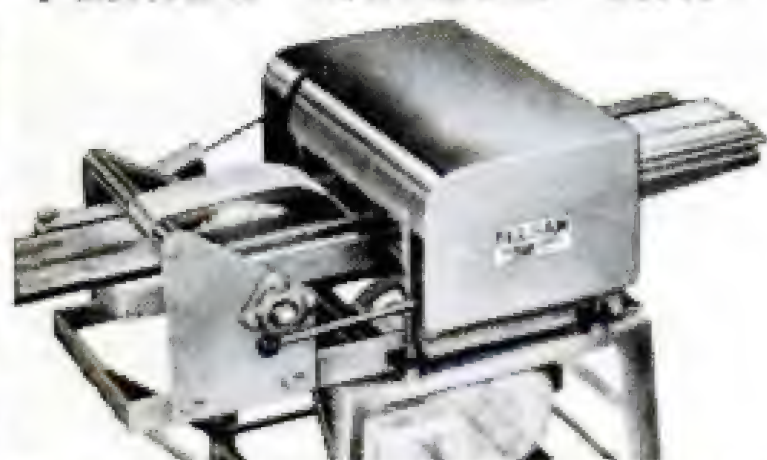
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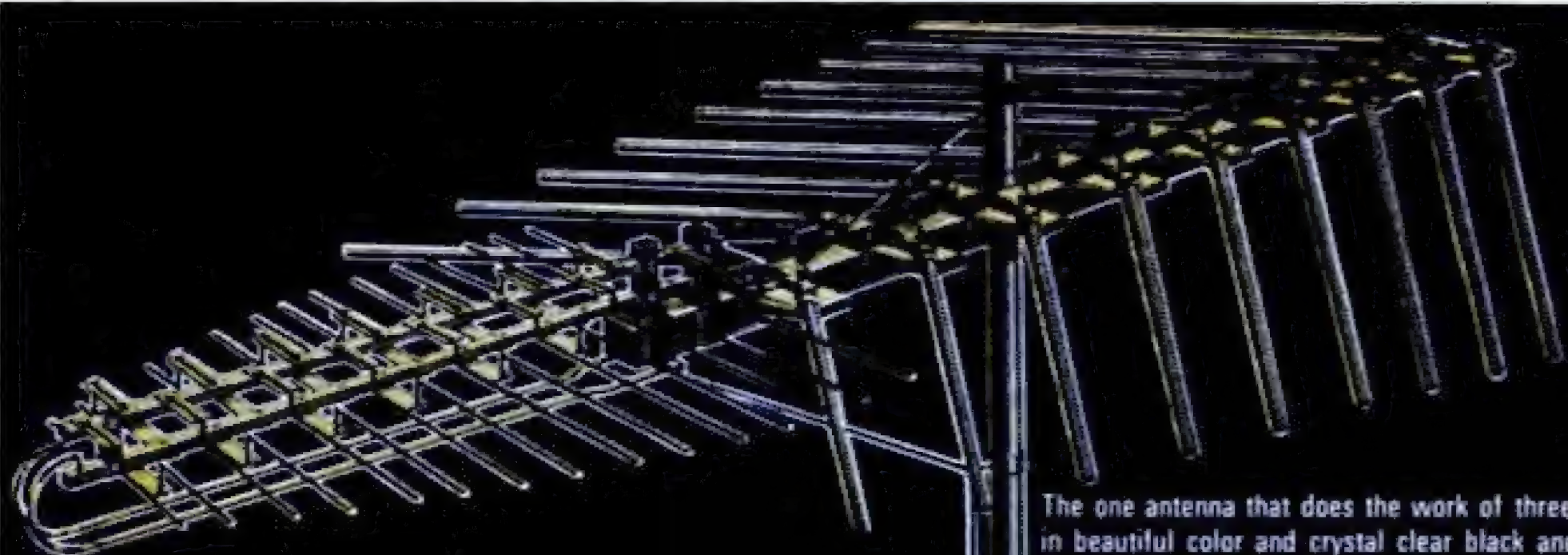
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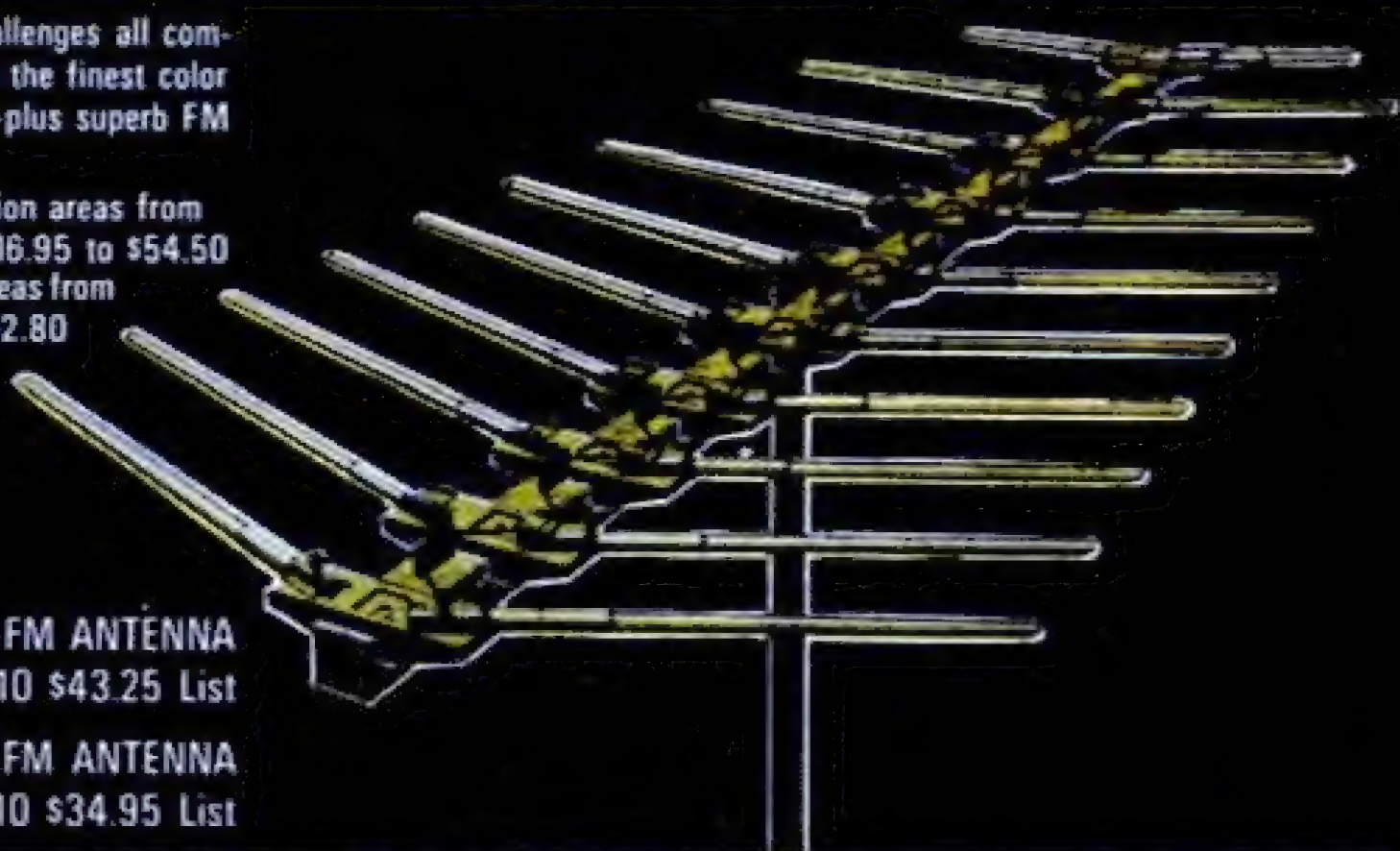
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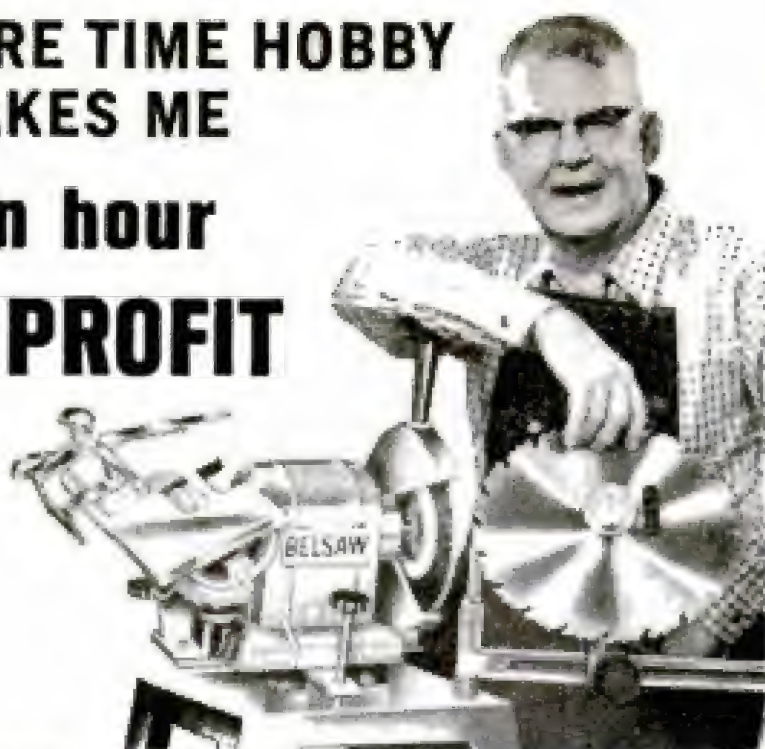
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FROM THE PATENT OFFICE **NEW  
INVENTIONS**  
BY M. J. PEDERSEN

**Desalting by freezing** of ocean water is being accomplished at two plants at least; one at Eilat, Israel, the other at the U.S. Department of Interior's test station at Wrightsville Beach, N.C. The principle in general rests on the fact that seawater begins to freeze at 28.4° F. and the ice crystals formed are essentially salt-free. The particular process that recently received patent 3,255,603 involves the "flash evaporation" of precooled seawater to produce ice. The chilled seawater is sprayed into an evacuated tank whereupon part of the liquid vaporizes and part freezes. The ice is then separated from the brine and the surface salt clinging to the ice crystals removed. Final step is melting the ice. Wallace E. Johnson, John H. Davids and Dieter K. Emmermann, Beloit, Wis., assigned rights to Desalination Plants Ltd., Tel Aviv, Israel.

**Irregular heartbeats** may be corrected by an electrical cardiac pacer implanted entirely within the body. Such pacemakers send electrical signals to the heart muscles and are man-made substitutes for the body's natural pacemaker—the sinoatrial node—that coordinates the beating of heart chambers. Dr. William P. Murphy Jr. and John W. Keller Jr. earned patent 3,253,595 and assigned rights to Cordis Corp., Miami, Fla. Keller received a coronary patent, 3,253,596, for an electrical circuit to control the timing of the cardiac pacer.

**Computer error-tester** has its own tester for malfunction in circuit designs that received patent 3,257,546 for William McGovern of Poughkeepsie, N. Y. The double-check circuits operate during every computing cycle (which lasts only a millionth of a second), indicating whether the error-checking circuits built into a digital computer are really doing their job.

**Super-cooling arrangement** for maintaining space-vehicle equipment near absolute zero (459.7° below zero F.) received patent 3,253,423 for David Sonnabend, Menlo Park, Calif. The deep-chill system, which has no moving parts, uses instead a metallic heat-conducting wire to transfer heat from the device to be cooled to a heat sink on the satellite's surface.



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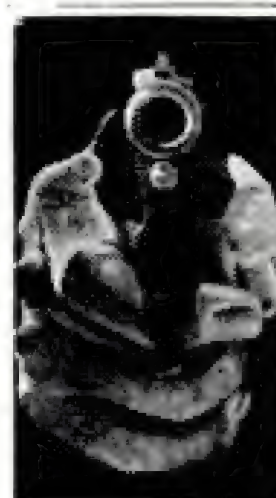
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**W**ITH NATIONAL MOTORCYCLE registrations now up around 1,600,000, about the hottest thing a mechanically-minded young fellow can get into these days is the motorcycle servicing and repair field. Dealers are so desperate for good mechanics that a sort of free-for-all has developed in which they lure really competent mechanics away from each other with offers of better pay. In California, where motorbikes are a big thing, experienced mechanics sometimes earn \$200 a week or more, and pay of \$150 or \$175 is normal. In New York one distributor closed up when his prize mechanic left.

This shortage of motorcycle mechanics is not only the result of a sudden surge of interest in two-wheelers, but also the fact that, while trade schools have long offered courses for auto mechanics, almost none have had any for motorcycle men. The field was too small to justify it. Only 15,000 machines were imported in 1960. Now it is expected that 400,000 will come into the country this year from Japan, Italy, England, West Germany, Austria, etc., supplementing America's Harley-Davidson production.

As a result, dealers and independent repair shops have had to dig diligently to locate service men. Up until now about 90 percent of the candidates were motorcycle enthusiasts who could be persuaded to work on other peoples' machines. Sometimes the dealers, who often are mechanics themselves, trained these candidates. Today, manufacturers conduct training classes for dealers and mechanics.

However, these courses assume mechanical aptitude, and a familiarity with engines and electrical testing. Anxious as they are to find new men, dealers simply cannot take time to give basic training in mechanics. Training courses, which last from a few days to several weeks, concentrate on servicing one particular make of machine. However, a good mechanic can switch from a Honda to a Yamaha or a Suzuki or a B.M.W., or a B.S.A. with little additional training, which explains why it is so easy to switch around in these jobs.

Schools now are located all over. Honda, for example, has classes in Gardena, Calif., Racine, Wis., and Pennsauken, N.J. (near Camden). Suzuki has a school in Santa Ana, Calif. In the past, Triumph has held classes in cities such as Denver, Dallas, Wichita, etc., but training is given wher-

ever and whenever it is needed. Yamaha, which has conducted a regular training program for some years, will move to Cherry Hill, N.J., in December.

In many cities dealers have suggested to school authorities that motorcycle repair be added to the customary auto mechanic training courses in trade schools, and have offered substantial help. But while trade school authorities admit the need for such classes, only the Los Angeles Trade Tech Junior College in California is seriously contemplating such training at present. They are considering a two-year course which would provide a basic training in mechanics as well as specialized work on motorcycles and scooters.

New York distributors have been hiring Italian immigrants, who often are excellent mechanics. And in England an agency recruits mechanics for American dealers who will guarantee them work.

Motorcycle enthusiasts are quick to point out how much easier, pleasanter and cleaner working on a motorcycle is than working on a car. There's no climbing down into greasy pits or lying on your back while oil, water and bits of metal fall on your face. The motorcycle mechanic can sit or kneel beside his machine or mount it on a support and stand up to do the job. With no elaborate or complicated housing to remove, he can go to work immediately.

If you have the mechanical aptitude and are interested in getting into this work, your first move would be to contact a motorcycle dealer. He may run you through a sort of unofficial mechanical aptitude test to find out how useful you will be to him. Some dealers take on high school students who have never done motorcycle servicing, and pay them around \$1.50 an hour while they are learning. But men who have owned and driven cycles and have a good basic idea of how they work, make the best job prospects.

However you get into the trade, once you learn it, the future promises big possibilities. Many mechanics work up to be dealers or distributors.\*

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*\*Popular Mechanics' Career Chart, usually shown here, is being revised to include many new job categories and to reflect more accurate national demand. The U. S. Employment Service has promised the improved compilations for November.*



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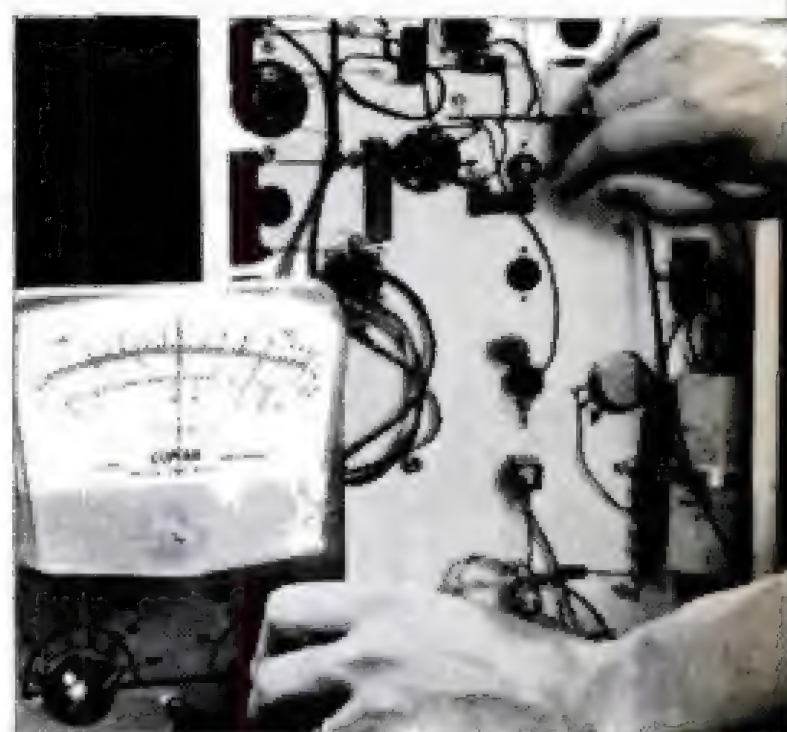
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# WHAT'S NEW OUTDOORS

BY STUART JAMES

**Camping '67** will see the Coleman Co. entering the tent trailer field with a newly designed fold-out. The success of their new line of sleeping bags and tents prompted the move, and the Wichita, Kans., firm has purchased the facilities of the Trimline Camper Co. as the base for the new operation.

**Problem with electric fishing reels,** I've always found, is that they never worked. That's changed. Woodstream Corp. of Lititz, Pa., has brought out a battery-operated spinning reel that is one of the slickest pieces of fishing equipment

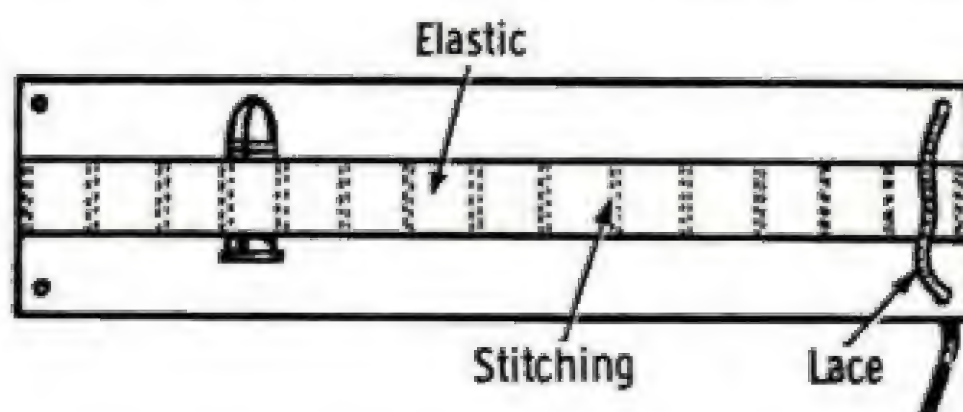


I've ever handled. It's not designed for horsing in a fish, but the three-speed variable retrieve (1:5 ratio) will work a fish of any size. It looks large, but it weighs only 26½ ounces, and the retrieve button is placed to give maximum wrist control of the rod. A rechargeable nickel-cadmium energy cell powers the reel for a full day of fishing. The plastic carrying case is equipped with a reserve power pack and a recharger that plugs into any household outlet. It's called the Reel-Lectric 1000, and it's expensive (\$150), but this rig is an engineering marvel.

**Cloaked in mystery,** a new weapon system is being developed in Austria for Smith & Wesson. I've learned that the new guns are extremely simplified designs and that they fire caseless ammunition. It sounds similar to the ammo that Daisy Co. has been working on, but S&W will not

release enough detail to tell. W. G. Gunn, president of S&W, says, "Although development of the system is well advanced, additional work must be done before it can be made available to the commercial market."

**No more shell fumbling** for plinkers or hunters who use a single-shot .22. The problem is solved with an easy-to-make wrist bandolier designed by Lincoln Drynan of Alberta, Canada. A strip of elastic



is sewn at intervals to a length of leather cut from an old belt. Two holes are punched at each end to insert a lace. The bullets are inserted in the elastic pockets and it is worn on the left wrist.

**Winter project** for station wagon campers is a compact travel kitchen that slides onto the tailgate and unfolds to provide a stand for the campstove and work area. For traveling it provides storage for stove,



dishes and food. A set of plans with complete instructions for building and step-by-step photos is available for \$1.50 from Dot Campers, Box 67, Saugus, Calif.

**Color-coded shot shells** are a new wrinkle in shooting safety. And an important one. I was trapshooting recently  
(Please turn to page 27)



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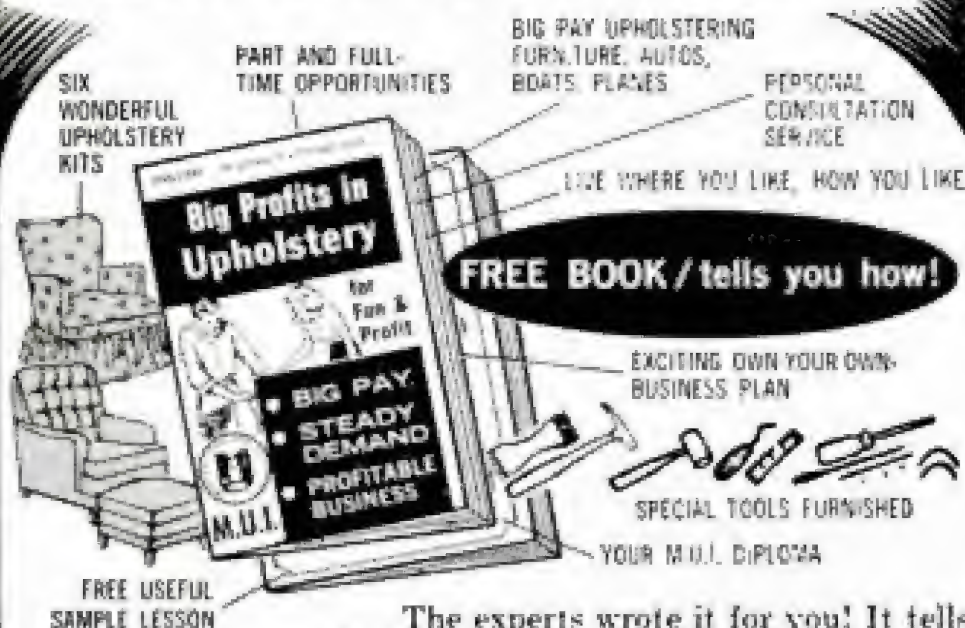
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## WHAT'S NEW OUTDOORS

(Continued from page 24)

at the Winchester Franchise gun club at Clinton, N.J., using both 12 and 20-gauge, and I very nearly slipped a 20-gauge shell into the 12 gauge. This can be disastrous, so I was pleased to see that Federal Cartridge of Minneapolis has come up with the color code solution to the problem. They have red, purple and yellow for three different sizes. It's almost impossible to make a mistake.

**Boating enthusiasts travel** almost as much as campers. A survey made by the Outboard Boating Club of America shows that more than half of their 20,000 members haul their boats at least 25 miles to get to their favorite water, and nearly a third reported that they travel at least 50 miles to float their craft. The survey also disclosed a need for more launching ramps with 71 percent reporting a general lack of this facility.

**4-in-one tool for skiers,** a new multi-purpose gadget, is ideal for fishermen, boaters or hunters. It is a pair of pliers



that incorporates a wire cutter, a screwdriver and an adjustable wrench. It sells for \$4.60 from Procter Products, 8148 Outlook, Shawnee Mission, Kans.

**A boatman is never without** a daylight distress signal as long as he can use his arms, according to the U.S. Coast Guard. By slowly raising and lowering his arms, outstretched to each side, he can indicate to passing vessels or searching aircraft that he is in distress. To make the signal more easily visible, hold a handkerchief, towel, shirt or other eye-catcher in each hand. One big virtue of this signal is that it can't be confused with a friendly wave. Other common small-craft distress signals include continuous sounding of the fog horn, flares, orange-colored smoke signals and the word "Mayday" spoken over the radiotelephone.

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PM-1



# SOLUTIONS FOR MECHANICAL HEADACHES

# AUTOMOBILE CLINIC

BY MORT SCHULTZ

## An Imperial squeak

*I've just bought a beautiful, used '63 Imperial that's in excellent shape. I've just got one "audible" complaint about it—a continuous squeaky-chirping noise coming from the front of the engine. I realize this is a pretty generalized description, but I wonder if you have anything in your records to indicate that this particular problem might have been peculiar to '63 Imperials.—Bob Bernstein, New York City.*

You wondered right, Bob. This particular problem was common not only with '63 Imperials, but with the Chryslers, Plymouths and Valiants of that year as well. Chances are that either the drive belt or water pump is at fault.

Check the belt first to see that it's properly adjusted. With the engine turning at idle speed, pour a little water on the belt. If the belt's at fault, the water will temporarily silence the squeak. Make sure too that the belt is in true alignment with the pulleys it drives. If squeaking persists, replace the belt.

A worn water-pump seal could also cause this noise. In this case, adding some MoPar Silicone Water Pump Lubricant (Part No. 2298997) to the cooling system may solve the problem. If the "birdie" still chirps, better get a new pump. Replacement pumps for your car are of an improved design over the original factory-installed units.

## Shaky Chevy

*My '65 Chevy Malibu actually quivers whenever I pull away from a dead stop at low speeds. I've had a top mechanic replace a weak motor mount, do an engine tuneup and check out the ignition and carburetor. Nothing's helped. What's wrong?—Robert E. Neaves, Rantoul, Ill.*

The vibration could be due to improper driveshaft alignment—not uncommon with this car. To check this out, ask three or four of your friends to pile into the back seat, then do a slow pullaway as before. If there's a noticeable increase or decrease in vibration, you can pretty well finger the driveshaft as the villain. My theory: At low speeds the rear of the car has been tipping and throwing the

shaft out of line; thus, the resulting vibration would continue until the car returned to its normal level.

## One 'why' of engine whine

*Soon after the warranty expired on my '59 Chevy (which I bought new), the engine developed a whine that sounds like wind whistling through the leaves. It is most noticeable at idle speed. When the accelerator is depressed the whine rises to a high-pitched tone. One mechanic told me the distributor was at fault, so I bought a new distributor. The noise continues. Any ideas about what's causing it?—Walter W. Humberger, Oregon, Ohio.*

The best educated guess I can make at this distance is that the trouble may be found in the front timing seal. The seal in your car is made of neoprene, which has a tendency to dry out. The slight shrinkage that results when it does can be just enough to introduce a whine to the engine. If I were you, I wouldn't worry about it. It won't do any damage—and you might miss it when it's gone.

## The kickback is French

*The car's a '61 Renault Dauphine. The problem is hard starting and kickback while cranking. The mechanic says the starter is too small for the engine and that the armature twists under load. Have you ever heard of this?—Earl Baker, Dearborn, Mich.*

Yes I have, but from what I've seen it only happens to this car when the ignition is too far advanced.

## Fluid loss from power steering

*Why does the power steering unit of my '65 Olds F85 station wagon build up pressure to the extent that it is blown out through the breather cap? This only happens at high speeds—65 to 70 mph. Four Olds dealers have told me not to worry about it, that there's nothing wrong. But I'd still like to know why it happens. Do you know?—A. Vannucchi, San Francisco.*

*(Please turn to page 30)*



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## AUTOMOBILE CLINIC

(Continued from page 28)

I'd say the probable cause is a bum pressure relief valve, which is supposed to relieve fluid pressure in the system at high speeds. Put a new valve on and the unit will probably start behaving itself.

### Cluster's last stand?

*My '65 Dodge half-ton pickup equipped with hydraulic clutch slips out of second gear when I use that gear for braking or pulling. Is the clutch shot?—W. H. Brunner, Canal Zone, Panama.*

Maybe. Anyway, it's almost certainly a transmission problem. Often the trouble is too much end play in the cluster-gear assembly. Have a mechanic check this out. The ailment is curable.

### Cracking heads

*I have a '59 Triumph TR3 with a hair-line crack in the head between the valve seats on the No. 4 cylinder. This is the second head that's cracked in a six-month period. I'm considering buying a new Tri-*

*umph, but wonder if this is an inherent defect. Would appreciate your advice.—Harold M. Mathis, Troy, Ill.*

There are three common reasons why any engine head cracks. In order of prevalence, they are: an imperfection in the head casting, incorrect torquing when a new head's put on, and overheating. You could have the crack welded, but the weld may not hold and you'll end up having to get a new head anyway. This is a decision you'll have to make for yourself. You had bad luck with those two Triumph heads, but it is not an inherent defect of the car. ★ ★ ★

**Note:** The great reader response to Auto Clinic has resulted in a considerable backlog of letters. However, the recent introduction of a new, faster method for handling this mail will soon help speed back the answers to your inquiries. In the meantime, please be patient. Your letter is being researched and will be answered at the earliest possible date. Thanks.

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## Service Tips

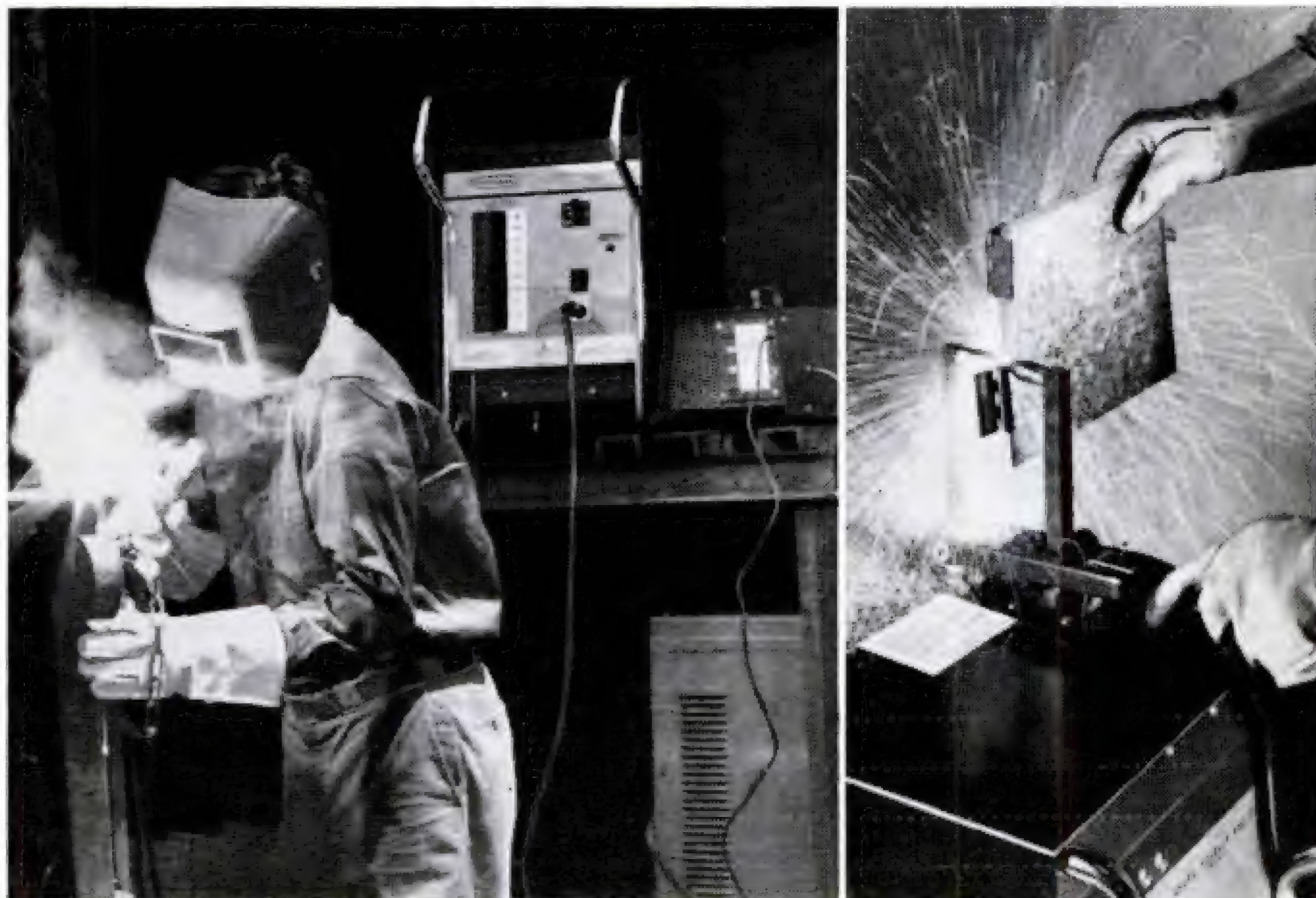
- **STATIC ZIGZAGGING** out of the radios in some '66 Chevys has been traced in many cases to an antenna with a poor ground contact. The company stresses that the electrical ground connection for the antenna must have a solid, clean ground surface before the ground ring is installed. Then the serrated edges of the ring can get a good bite into the metal when the ring is tightened down.
- **STUDEBAKER OWNERS** with '65 and '66 models may find that their cars' (Bendix) Folo-Thru Starter Drive tends to stick and fails to engage the starter ring gear. It can also stick in the engaged position and cause the starting motor to be constantly driven by the engine. The company states that this unit can usually be restored to normal operation by having it cleaned and lubricated. Service Bulletin J-1966-1 has been issued to your dealer and tells him how to perform this job. If the malfunction persists, you're entitled to a new part.
- **PONTIAC REPORTS** that in some cases the proper circuit breaker for specific options has not been installed in some '65 Pontiacs and Tempests. The result is damage to parts in the event of an electrical overload. If this happens, check the circuit breaker. A two-pronged breaker is used on all models with power seats and/or power windows, including the power tail-gate window on station wagons. The single prong breaker is a junction box used on convertibles **without** power seat or windows.

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Each month Auto Clinic answers questions on car repair. For a personal reply, send 50 cents in coin to cover mailing and handling. Write Auto Clinic, Popular Mechanics, 575 Lexington Ave., New York, N.Y. 10022. One question per letter, please.



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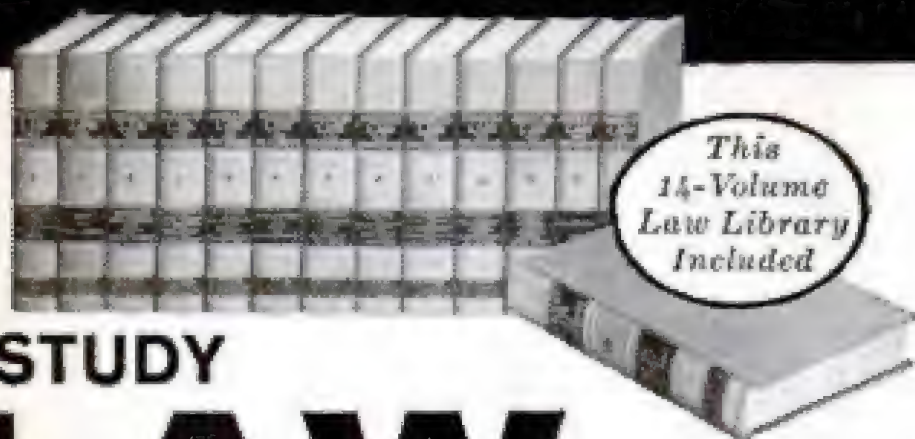
This Craftsman High Frequency Unit can be used with any welder with a rated amperage output up to 300 amps.

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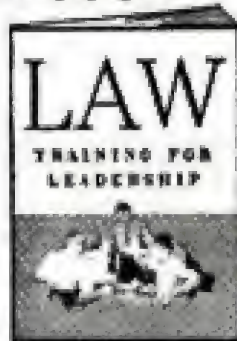
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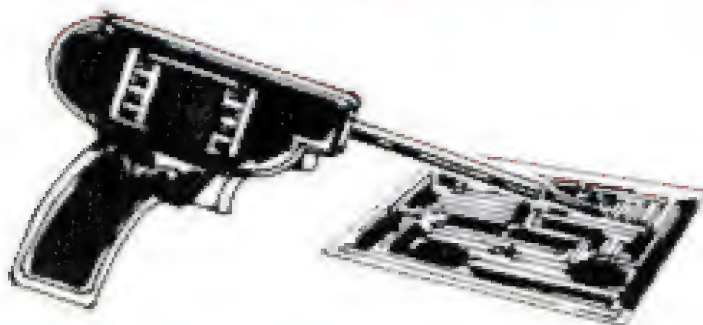
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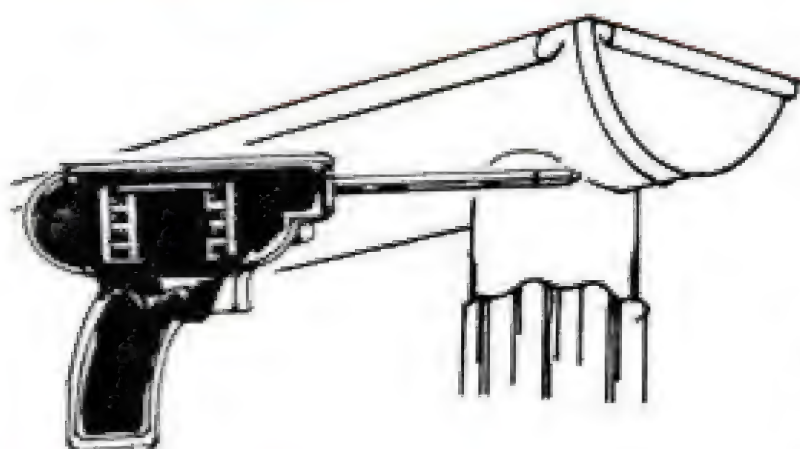
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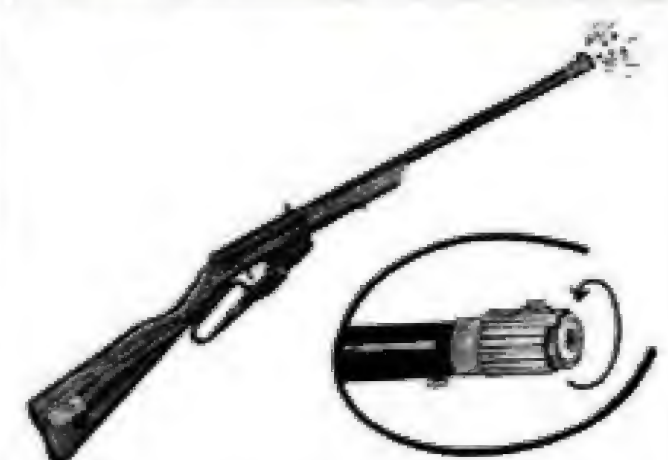
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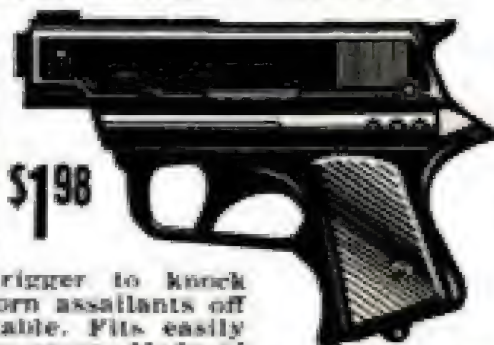
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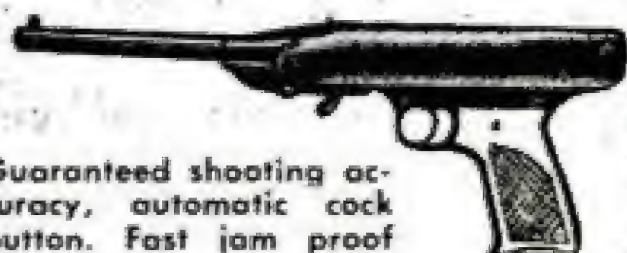


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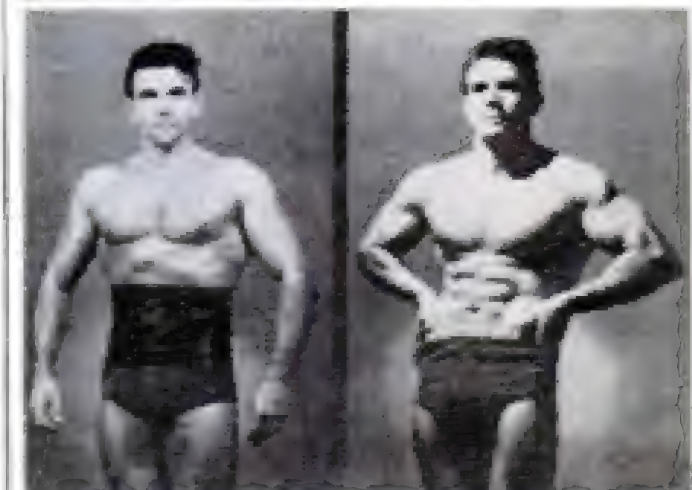
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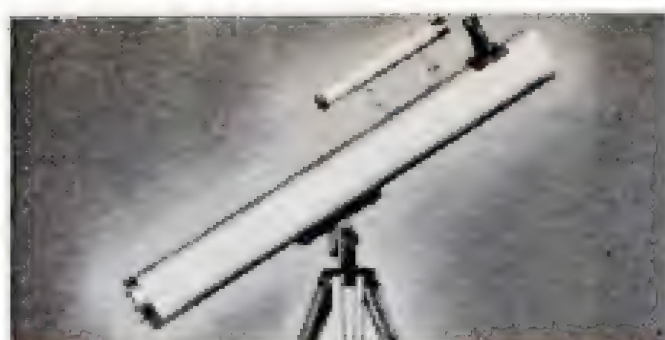
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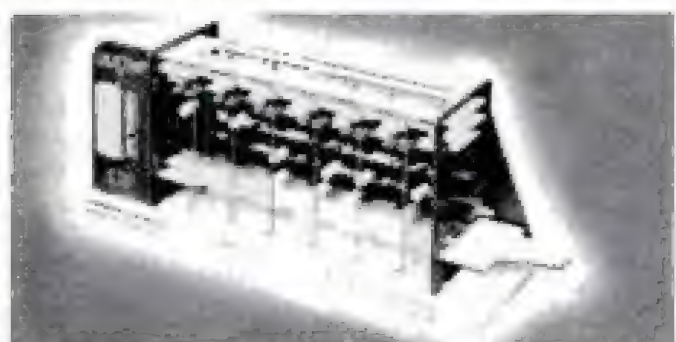




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DETROIT

# LISTENING POST

BOB IRVIN

**Pending federal safety legislation could ban the Thunderbird** from the nation's highways. The problem: The T-Bird's windshield wipers (along with those of similar lower volume, higher priced cars) at present fail to meet proposed government requirements as to the windshield glass area that must be wiped by the blades.

If the requirements are applied across-the-board next year under the new law, the T-Bird and certain of its competitors could be in trouble; the "wiped" area on the car comes close, but doesn't quite equal U.S. standards. Easy to fix? No! To move the wiper pivot points one inch to the right and change the windshield angle even slightly would require 17 major changes to the car—and this with less than a year to go before the '68s go into production. Ford brass doubts the necessary changes could be made in time, noting that required would be a new cowl, "A" pillar, roof, side windows and instrument panel. But there's an escape clause in the federal law; the government can grant an exemption to certain models that fail to meet specs. But in the process, Ford wants to know, will the T-Bird be branded "unsafe" because of a one-inch deficiency in the wiper pattern?

**Pontiac will have an entry in the "personal" car market** early next year. The car, based on the Chevy Camaro body shell, will be introduced at the Chicago auto show in February. Production will start January 2. The new car will be two to three inches longer than the Camaro, will probably be priced to compete with Mercury's new Cougar. Pontiac has been pushing hard to enter the field for some time, only got a go-ahead from GM top management last May.

**A disposable, energy-absorbing "front end"** is under consideration by Chrysler Corp. The device, installed in the front of a car, would be made of some cheap, expendable material, the purpose being to protect both car and occupants in the event of an accident. Car styling would not be affected in that the device would be decorative. Something similar is being tested by Ford, but with no production goal in mind. Ford, however, expects to have on the road in two years cars with front ends that collapse back as far as 24 inches. GM maintains present cars can collapse that far, expects to introduce only minor refinements of current designs.

**An auto "snooze alarm"** is being studied by a California firm. The gadget, hooked to the steering wheel, measures the number of times a driver moves the wheel. If, through weariness or boredom, the number of wheel movements declines below a certain level, a buzzer squawks to warn the driver. The device is an outgrowth of a "drivometer" developed by University of Michigan's Bruce Greenshields and Fletcher N. Platt, Ford's director of traffic and highway improvement. Platt received a patent on the new system in January and TRW Systems, Redondo Beach, Calif., is experimenting with it. TRW says the alarm should be especially useful to drivers who make long trips when fatigue, drowsiness or "highway hypnosis" can be a hazard.

**GM has developed a communications system** aimed at making expressway driving safer and easier. Called DAIR—driver aid, information, routing—the system includes a Citizens Band transceiver, a telephone-type dial, a TV-like display panel, and a punch card. Voice messages about, say, emergency traffic conditions can be transmitted to the driver via the CB transceiver. Help can be summoned by using the dial, attached to the radio. The display panel shows upcoming traffic signs. The punch card casts directional arrows on the display panel, thus eliminating the need for maps. Sound impossible? GM says much of the system's signaling is done by magnets buried at intervals along the road, adds the whole package is "based on existing technology."

*(Please turn to page 40)*



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## DETROIT LISTENING POST

(Continued from page 38)

as well as hardware that could be mass-produced right now. The unit, as being tested now, would cost about \$200 complete. Present experiments will be concluded next year when GM hopes the government will broaden the program.

### Aluminum engines may "come back."

Giant GM has developed a new process—called ACUARD (for "accurate, rapid and dense") for die-casting aluminum auto parts. Key to the process is widening the die opening and altering the plunger that forces the molten metal into the cavity, developments that are said to increase casting strength. "We think it will revolutionize aluminum die casting," says GM manufacturing development director Harry Hall. A possibility? Casting thinwall aluminum engines. However, GM says it has no plans to do so at present.

### AMC may pop with a sports car

during the 1968 model production run. The company hopes to have a production prototype ready soon, probably based on the "ramble-seat" AMX, a design exhibited extensively this past year and one that has gained wide public approval. Stylists are changing some features of the car so it can go into production—a more conventional "A" pillar windshield, altered bumper heights, circular headlamps rather than square. New AMC chairman Robert B. Evans says the firm is proceeding "cautiously in a hurry." Still to be decided is whether to build the car in fiberglass or steel. Metal would take longer to tool, but volume would be higher. The car would take dead aim at the Mustang-type market. Evans says AMC's "subcompact" idea car—the Cavalier—is "a little further" away from production because a running model has yet to be made. Big feature of the proposed Cavalier is interchangeable body components—cheap to tool for and build, cheap to maintain.

**What will cars be like in 2016?** The Automobile Club of Michigan, this year celebrating its 50th anniversary, wondered about this recently and approached widely publicized seer Jeane Dixon, asked her to gaze into her crystal ball and come up with a few answers. Fifty years from now, Miss Dixon predicted, cars will flit back and forth on cushions of air, the wheels retracting upon starting. They will be fueled by some exotic new compound yet to be developed; gasoline as we know it will have gone the way of the buggy

(Please turn to page 43)



# "If I had my choice of any car on my test lot, I'd pick the 'Jeep' Wagoneer"



Noted critic and test driver Tom McCahill remarks on the new 'Jeep' Wagoneer.

Recently, in *Mechanix Illustrated*\*, Tom McCahill said, "My front yard usually resembles a clearing house for a hot car ring. At present, better than \$50,000 worth of autos stand there broiling in the hot Florida sun...of the whole kit and caboodle, my choice would be the 'Jeep' Wagoneer."

Nearly everyone who's driven the new 4-wheel drive 'Jeep' Wagoneer agrees it's the most versatile car ever produced. "It rides like the best Detroit has to offer," says McCahill. "But it'll go places you just wouldn't dream of going in an ordinary car.

And, it looks just as much at home in the parking lot of the most posh country club as it does next to a prairie camp fire." Concluding his article, McCahill said, "The Wagoneer is built like a bank vault and, if my calculations are worth a hoot, it will experience a lot less trouble in five years than many of the fancy Dats that can crack above 130 and easily eat you out of house and home."

\*A reprint of complete article will be sent on request. Write: Dept. PM 1, Box 903, Toledo, Ohio 43601.

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So were all the others.

## Army





## DETROIT LISTENING POST

(Continued from page 40)

whip. A radarlike device will guard against cars being involved in accidents. Consensus here is that Miss Dixon is on fairly safe ground as to her predictions, the auto manufacturers having gazed into the same crystal ball several years ago. "Studies" of such designs and gadgetry are already in the works, although a long, long way from fruition.

**The U.S. Coast Guard**—of all things—has a hand in regulating one phase of Chrysler Corp.'s overall operations. Before one of the company's new marine engine designs can go into production, it has to be certified as "safe" by the Coast Guard. A proposed production engine is sent to the University of Detroit where engineers check to make certain it meets USCG requirements. If it does, U. of D. notifies Washington, which then sends a letter of certification to Chrysler. In the case of Chrysler's latest such design, this process took two months. Question: If, under the new U.S. law, cars have to be certified "safe" before they go into production, will a monkey wrench be thrown into model changeover schedules?

**The ranks of veteran auto executives** are thinning out, but John Korb—at 69 years of age—is still going strong. Now a semiretired executive with the export division of American Motors, Korb is a manufacturing expert of the old school. He was 16 when he started in the model room of Willys-Overland's Toledo plant back in 1913. Walter Chrysler called Korb "The Kid." He worked with other legendary auto pioneers like K. T. Keller and Charles Nash. After World War II, old friend Joe Frazer summoned him to convert the Willow Run bomber plant outside of Detroit over to the manufacture of automobiles. "That was a tough assignment," Korb recalls. "We couldn't even get steel for the paint ovens and we had to build them out of wood and asbestos. We had the fire department standing by night and day." Korb says Kaiser-Frazer "had the best-trimmed cars in the country at that time" simply because he had to decorate them with the only thing available—suit material costing \$7 per yard. Korb resigned from K-F in 1948 and took the job with AMC, his main chore in the years since being the building of assembly plants in various quarters of the globe. His latest assignment saw him in Iran where, after putting the plant up, he had to teach shepherds how to build cars. ★ ★ ★



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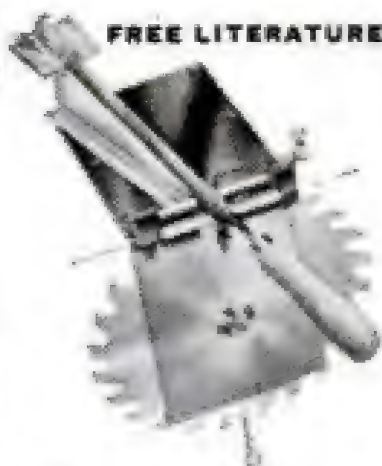


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# HOMESOWNERS' CLINIC

BY W. CLYDE LAMMEY

## Cracked headboard

*I have a maple double bed, not old, with both head and footboards of solid wood. The headboard is cracked from one end along the length, the crack extending about half the width. The break is fairly straight, apparently following the grain, and is about six in. from the top. I suppose it can be glued back in place, but how?—S.E., Ore.*

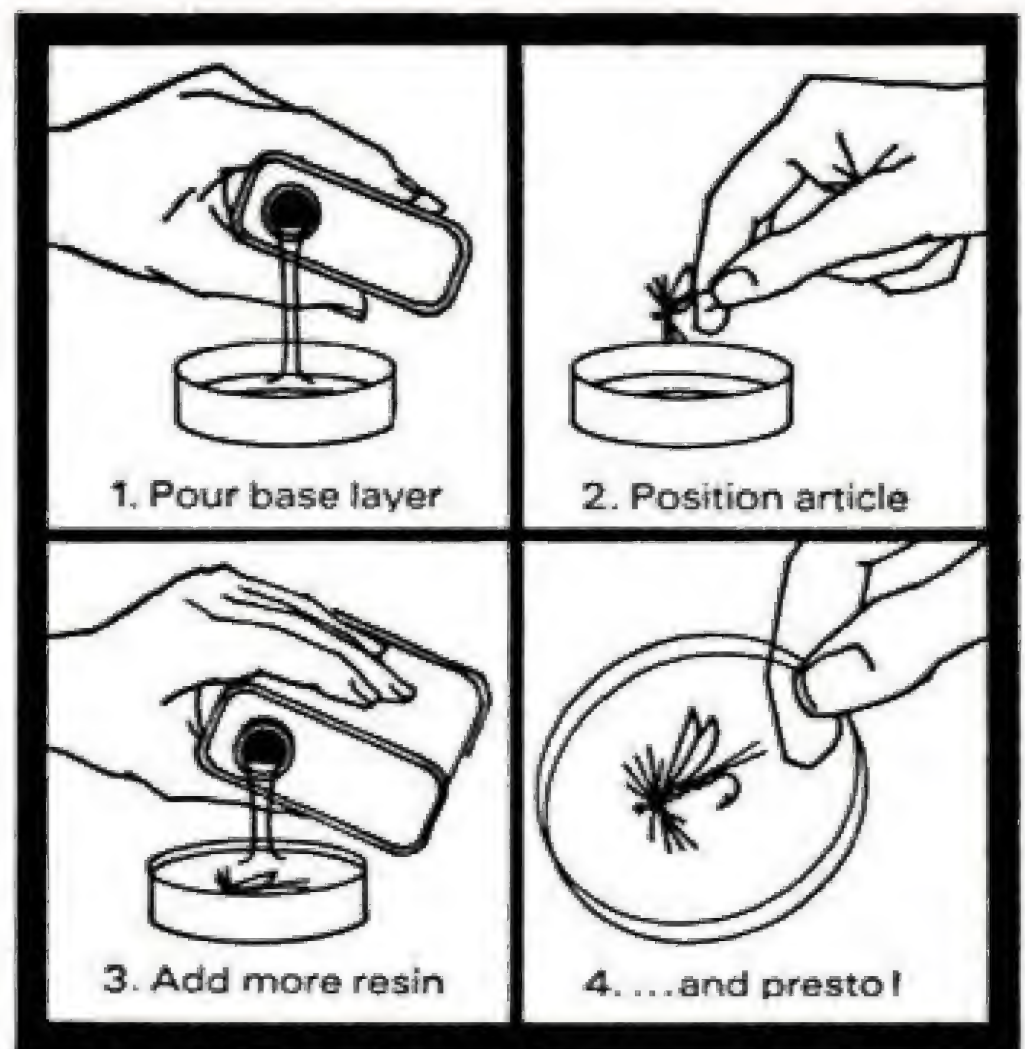
Usually the "how" is quite simple if the break is relatively new and the wood is not warped unduly. Wedge the break open  $\frac{1}{8}$  in. or so, taking care not to extend the split, and force glue into the opening, spreading the glue uniformly with the point of a small screwdriver, the blade of a penknife or a wood toothpick. Any "white" glue, the kind that comes in a squeeze bottle, will do for the purpose. Press the meeting edges tightly together, making sure the break joins uniformly along the length, and clamp with bar clamps for an hour or so. Have a damp cloth handy before gluing so that you can wipe away any excess glue immediately, as otherwise it may spot the finish along the break. If you don't have bar clamps, drive two or three small nails into the lower edge of the headboard, allowing the heads to project, tie strong cords to these, loop the cords over the top of the headboard and tie the free ends to the spring under tension. Rarely is a break of this nature entirely concealed by the repair. So you select a "Putty Stik" of a color that matches the finish and run the point along the joint.

## Replace, or repair?

*One of my double laundry tubs is chipped close to the drain, enough so there is a slight leak. Apparently it has been chipped for some time, but the leak has developed only lately. Should I replace the tubs, or is it possible to make a repair?—B.R., Okla.*

Usually it's possible to turn the trick with hydraulic cement, but much depends on just where the chip is located and whether you can get the area thoroughly clean. All the soap residues, dirt and any loose material must be removed as otherwise the cement won't bond to the old.

(Please turn to page 48)



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## HOMEOWNERS' CLINIC

(Continued from page 47)

First, go after the residues with a strong soapy solution or a degradable laundry compound such as "Amway", using a scrub brush, wire brush—anything that will get into all the crannies and crevices of the chipped area. Rinse thoroughly, mix the cement according to the instructions—a fairly stiff mix—insert the drain plug, or stopper, and apply in any way that forces the mix into the depression, using the fingers if necessary to press in place. Strike off flush with a small trowel.

### Popping plenum

*The cold-air chamber on my forced warm-air furnace gives with a loud bang each time the fan shuts off. I find it's the side next the hot-air chamber that's doing the banging. Can't wedge it with wood as the hot chamber gets pretty hot. The cold side is only about 2 in. from the hot side. Can you help us? The bang wakes everybody in the house.—D.L., Minn.*

Rather than stay awake listening for the next "bang," try this: Remove the back access panel, or the side panels, of the fan compartment and take out the filters so that you can reach up inside the plenum. Tap lightly—note I said lightly—with a

hammer at points near the four corners of the side near the warm-air plenum. It just could be that the light hammer blows will add sufficient tension to prevent the panel being drawn inward by the fan suction and then popping out again when the fan stops, like the bottom of an oilcan when the pressure of your finger is released. If not, then sterner measures are needed. Cut a length of  $\frac{1}{8} \times \frac{3}{4}$ -in. aluminum bar stock to fit across the width of the plenum on the inside. Bend this to a slight bow shape, drill holes for metal screws near the ends and attach this with the bow bearing against the side of the plenum.

### Worming the garden

*Our tiny garden plot was full of earthworms last season and I want to know what to do next spring to get rid of them for good. Can you suggest something?—N.K., Mo.*

A very deep spading in the fall often tends to cause the worms to seek new locations but, of course, you'll never be entirely rid of them through use of this method. Any insecticide containing chlor-dane will usually eliminate them entirely for a season or two, possibly longer, but one should be mindful of the hazards connected with any unrestricted use of this chemical. Follow instructions closely.



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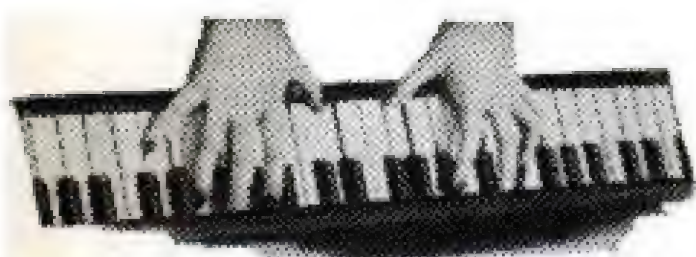


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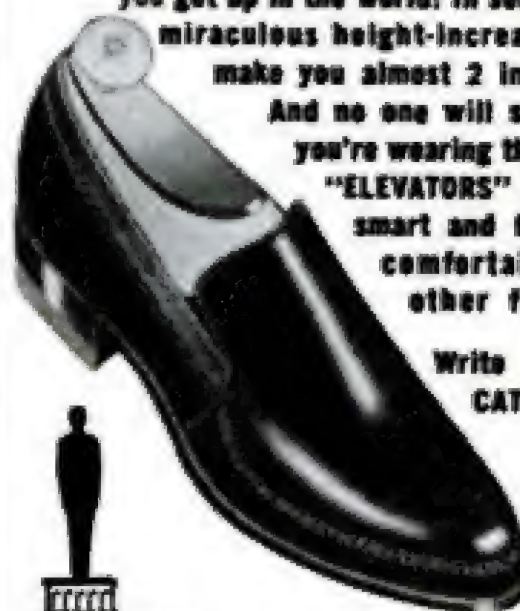


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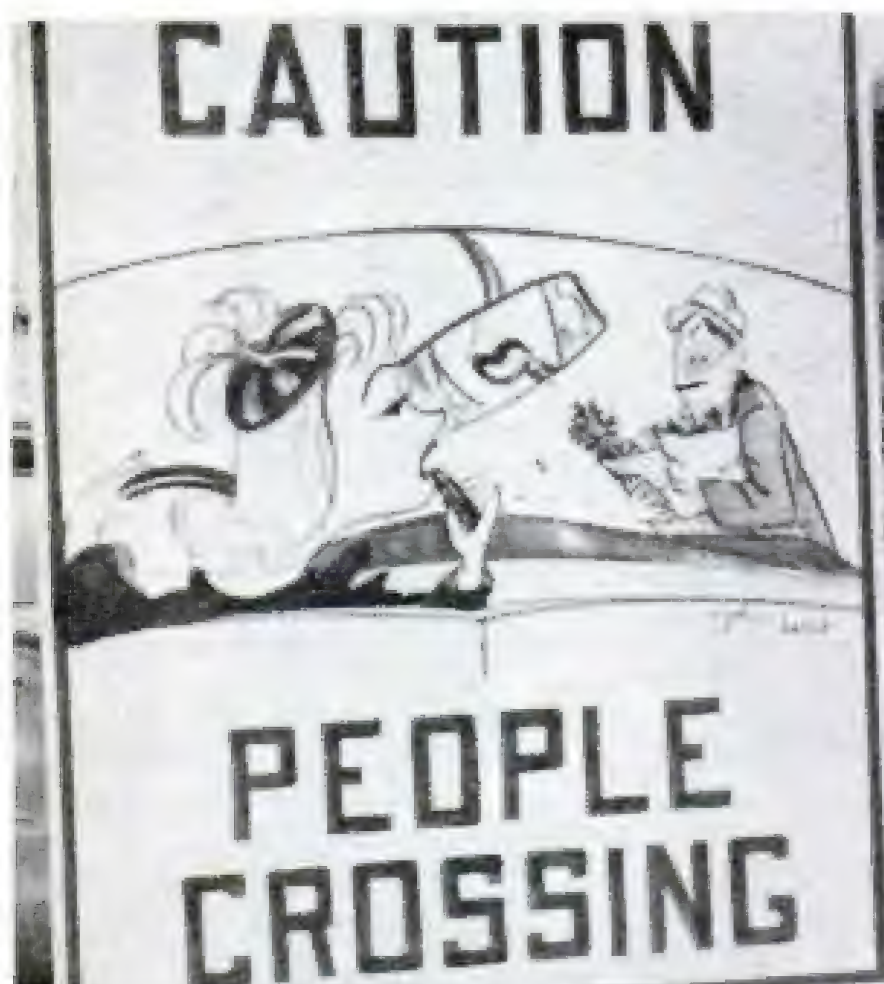
OCTOBER 1966



# Stop, Look—and Laugh!

TRAFFIC SAFETY is a somber subject these days, and artist-photographer John Cameola thinks a smile might help. In his opinion, traffic signs frequently are overlooked because they just stand there, saying the same old things in the same gloomy, authoritative way. A bit of humor might make drivers sit up, smile—and even take notice!

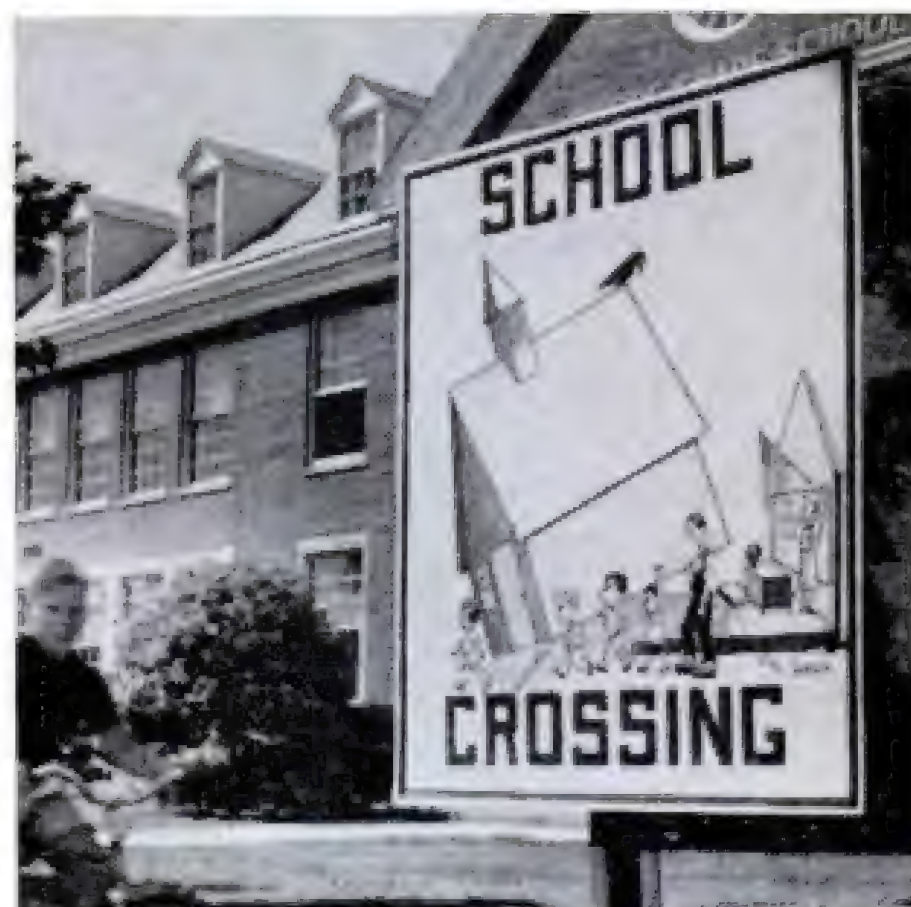
—Clifford B. Hicks



**YEP, HE'S GOING TO BE CLOBBERED** by that lipstick. But other women drivers may be snapped to attention



**SO YOUR NOSE** isn't that big! Still, you'd better check, or you'll be slopping down the highway, too



**THE KIDS GET OUT EARLY** today; there's a teachers' meeting to discuss vandalism around the school





**KEEP YOUR EYE** on the switchman for a spectacular disappearing trick that could happen to your car, too



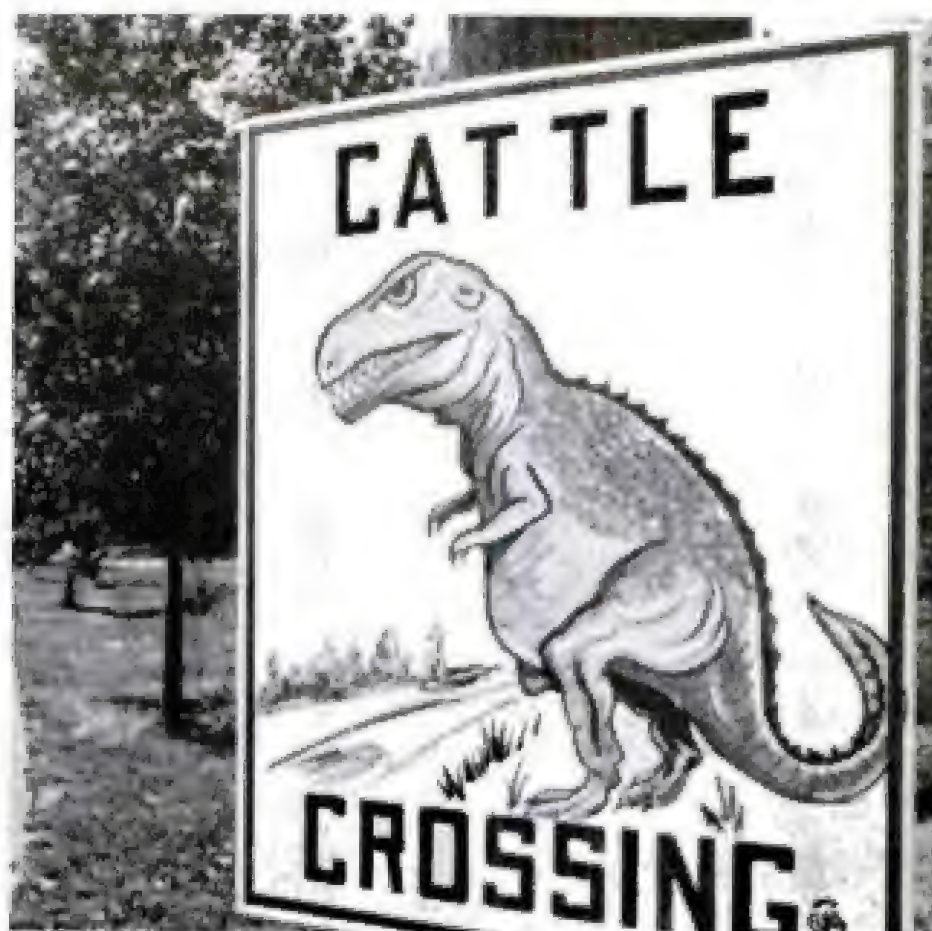
**THIS TRAFFIC SIGN SAYS IT** without kidding around. Screeeeeeeeeeeeeeeech! Maybe you'd better stop



**GRAPHIC REMINDER** that if your attention wanders while you're at the wheel, you're playing with dynamite



**U TURN** and U're in for trouble with the police! All signs should make as good a pitch for traffic safety



**IT'S EVENING**, and the cows are wandering in from the west pasture to be milked in the Flintstone barn



**POPULAR MECHANICS**  
Reports on New  
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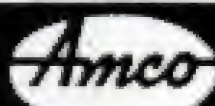
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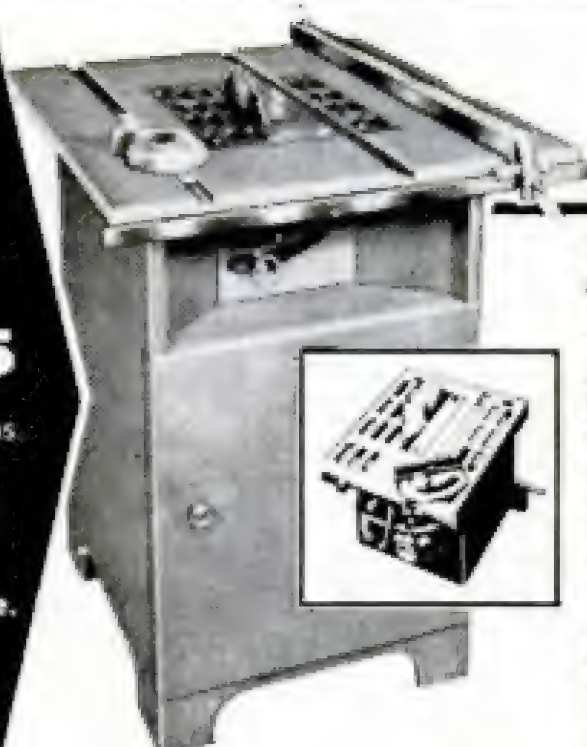
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If desired, RIP FENCE  
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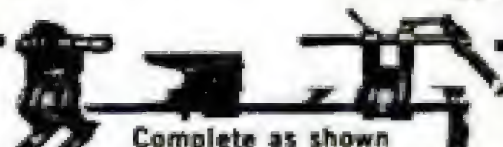
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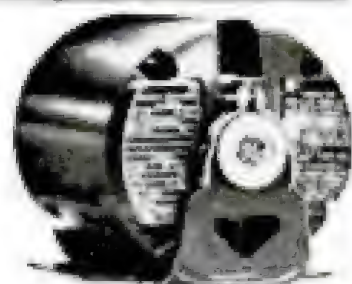
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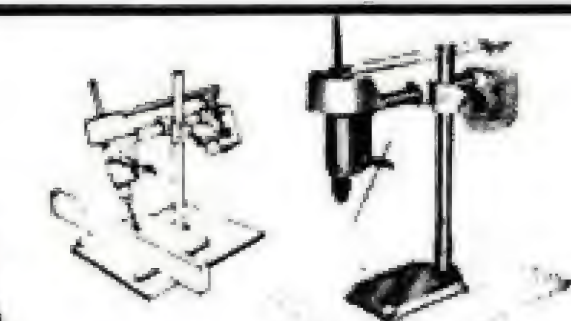
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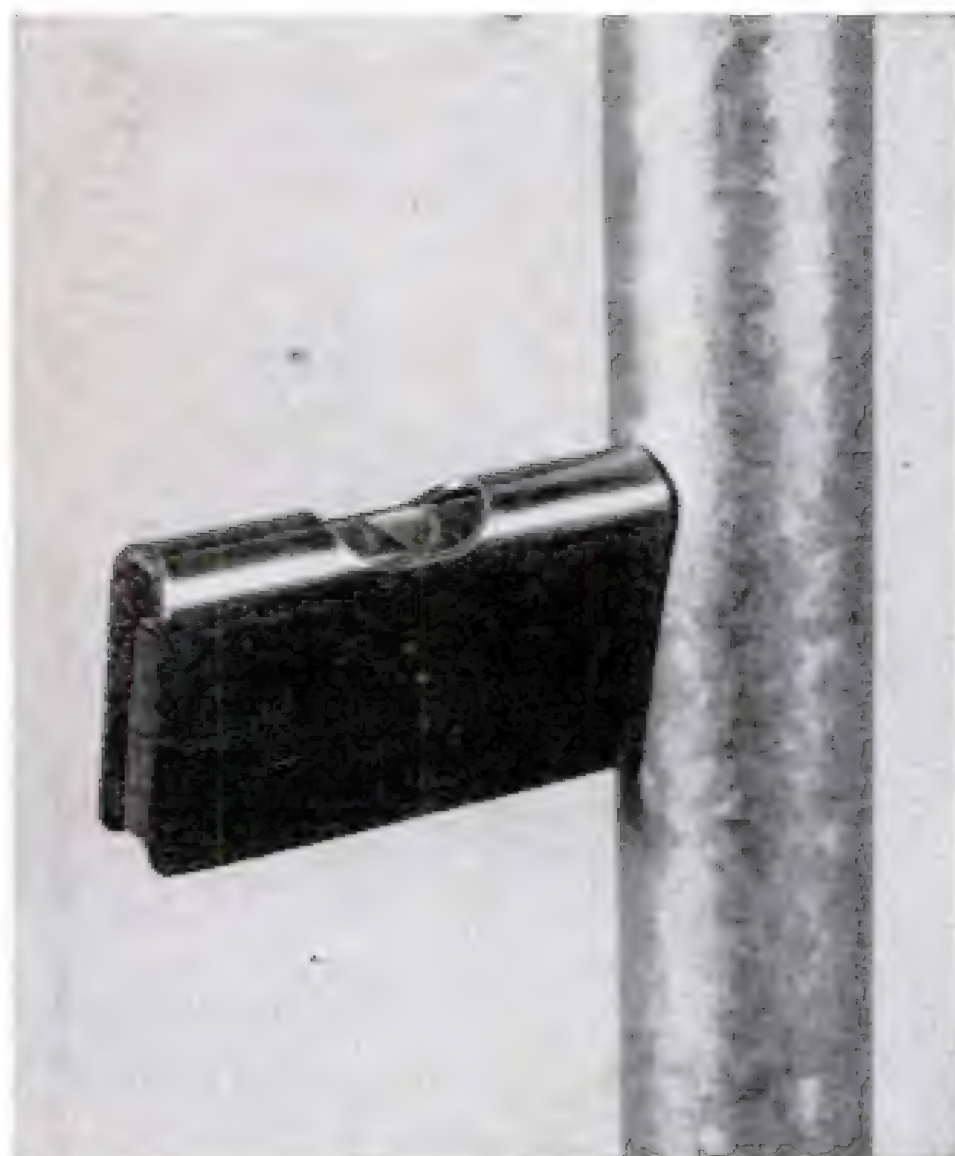
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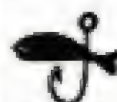
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FREE! Furnished apartment, plus \$400-\$1,000 monthly salary, if qualified as Motel Manager. Live graciously, meet VIPs. Train at home. Earn diploma from approved school. Free placement assistance. Openings for men, women, couples. If over 21, write for facts. Motel Management, Dept. 406, 2433 N. Mayfair Rd., Milwaukee, Wisc. 53226.



**WANT To make big money at home?** \$10.00 profit in an hour possible with invisible mending. Make tears, holes disappear from clothing, fabrics. Steady year-round demand from cleaners, laundries, homes. Details free. Fabricon, 1585 Howard, Chicago, Ill. 60626.

**\$70.00 WEEKLY**—home, spare time. Simplified mail bookkeeping. Immediate income. easy. Audtax, 34741a, Los Angeles 90034.

**RAISE Rabbits** for us on \$500 month plan. Free details. White's Rabbitry, Mt. Vernon, Ohio.

**SAVE 40%!** Make your own professional rubber stamp manufacturing press! Parts list, photo-diagrams, instructions, \$1.00 (refundable). Garmac, 769 Rio Grande Bldg., Dallas, Texas 75502.

**EXPLOSIVE!!!** Mailorder business goldmine. Terrific! Moneymaking details free. Livingston's, Box 5332, North Charleston 1, South Carolina 29406.

**LOW-Risk** mailorder can easily net \$1-000 monthly. Free details. Gordon, Box 212C, Pompano Beach, Florida 33061.

**LIQUID** Molding rubber also liquid plastic. Free information. Chaney's, 5415-A San Jose Blvd., Jacksonville, Fla. 32207.

**\$25.00-\$75.00 WEEKLY** Possible. Addressing envelopes. Compiling names. (Longhand—typewriter) Details free. Superior, Box 721-A, Elkton, Maryland 21921.

**COPUBLISH** "Mail Sale Advertiser," leading mailorder paper. Copy and details 25¢. Vanroy Shirk, Lebanon, Pa. 17042.

**STREAMLINED** Mailorder course. Twenty-four different lessons, \$2.00 complete. Dealers wanted. Neil H. Tasker, Shamokin, Pennsylvania.

**BAKE** New greaseless doughnuts in kitchen. Stores buy output. Start spare time. Profit 29¢ dozen. Small appliance. Free recipes. Montgomery Ray, Waseca, Minnesota 56093.

**MAILORDER**—Profitable items, drop-shipped. Everything supplied. National Mdrs., 3408½ Motor, Los Angeles 90034.

**BONSAI** Tiny trees. Home study course teaches you. Make beautiful prize artificial trees, arrangements. Grow valuable living miniatures too. Spare time—full time. Big profit. Free tree offer. Free fact pack. Minitree, Dept. AS, 12305 Hawthorne Blvd., Hawthorne, Calif. 90250.

**I MADE \$40,000.00** year by mailorder! Helped others make money! Start with \$10.00. Free proof. Torrey, Box 63566-Y, Oklahoma City, Oklahoma 73106.

**PLASTERCRAFT** Molds, liquid rubber, plasters, socks, candle supplies. Catalog and manual free. Blue Rapids Supply, Blue Rapids, Kansas.

**FREE Report:** "609 Unusual, Successful Businesses!" Box 51-PO, Des Plaines, Illinois 60017.

**ECUADOR** Gold Expedition now forming. Share profits. Lee Baker, 2606 Newhall, Santa Clara, California.

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**VACUUM** Plastic molding & liquid plastic casting—At home! Make hundreds of full 3-D plastic products. Big profit in spare time. Free facts, samples. Nationwide Plastics, Dept. WC, 12305 Hawthorne Blvd., Hawthorne, Calif. 90250.

**EARN** Money raising fishworms for us! Write: Oakhaven-38, Cedar Hill, Texas.

**FREE!** Circular. How to start and operate your own mailorder business. You must have information to be successful. Write today! Darling & Sons Mail Order, Box 201, Fenton, Mich.

**CO-Publish** "Home Business Digest." Earn money at home. 3 pages instructions, free! Lonnquist, Box 500, Bella Coola, B.C. Canada.

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**PROFITABLE!** Inexpensive! 500% profit selling our directories, folios, manuals! Circulars supplied. We drop-ship. Mashburn's, Enka, N.C. 28728.

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**MEN—Women**, Everybody likes fine candy. Make professionally home. (Our 51st year). Ragsdale Candies, B107, East Orange, New Jersey.

**U-IRON** Letters, Pictures, Emblems On T- & Sweatshirts. Big profit full or spare time, at home or ? Free samples. Lettering Unlimited, Dept. AE, 810 E. Washington Blvd., Los Angeles, Calif. 90015.

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**OPERATE** Restaurant or diner. Free booklet reveals profitable plan. Write Restaurant Business School, Dept. EC-106, 1920 Sunnyside, Chicago, Illinois 60640.

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**HOLLYWOOD CEMENTCRAFT:** Offers highly profitable home business; experience unnecessary. Unlimited unique pottery designs easily made without moulds. Birdbaths, fountains, wishing wells, waterfalls, rustic gardens, patio items, marbleizing, cement coloring formulas, etc. **FREE** illustrated brochure. Concrete Facts, 602 Athens Street, Altadena, California 91001.

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**FREE** Report. "Home business opportunities." Immediate earnings! Wyman, H-121, Congers, New York 10920.

**HOME** Book match mail order business. Lifetime commissions. No selling. Details free. Snyder's, Box 55-E, Bangor, Pa. 18013.

**START** Your own business—selling printing. We fill orders. Free sample catalog, information. Sutton Printing, Box 853, Waycross, Georgia 31501.

**"HOW** To acquire lifetime income." Free brochure. Anderson's, 5 Woodland, Stoneham, Mass. 02180.

**OPERATE** Profitable mailorder business. Write: Ellis, Box 224-P3, Prospect Heights, Illinois 60070.

**SENSATIONAL** New manicure aid nail files with sapphire dust. Personal, Box 321, North Hollywood, California 91603.

**EARTHWORM** Growers Needed! Good paying home business! You raise, we buy! Free picture folder! Cal-Bait, 8616 Fair Oaks Boulevard, Carmichael, California 95606.

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**BIG** Money raising fishworms and crickets. Free literature. Carter Hatchery, Plains, Georgia.

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**RAISE** Rabbits and fishworms on \$500 month plan. Free details. White's Rabbitry, Mt. Vernon, Ohio.

**LEARN** The secrets of repairing junk batteries. "Fabulous Profits" at home. Details. The Batteryman, P.O. Box 477, San Marcos, Calif.

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**INVESTIGATE** Accidents for insurance and transportation companies. Work from home in spare time. No previous experience or college education necessary. Some men make up to \$8 an hour, plus expenses. We train you at home by mail through easy 15 minutes a day program. For free information write Liberty School, Dept. A59, 162 East Cook, Libertyville, Illinois 60048.

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**WE'LL** Help you plan—mail order business—part or full time. Free details. Ad-Creators, Hutchinson, Kansas 67501.

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**LEARN** "What's Behind" 72 advertised moneymaking offers, in "One" revealing package. Save time, trouble, expense! Mann's, A-266, Hillsdale, New Jersey 07642.

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**MAKE** Big Money—over 400 ways to be your own boss. Details free. Arch Associates, 216-PM Jackson, Chicago 60606.

**SWEEPSTAKES** Contests. How to win. Write for free information. General Contests, 1609-18 East 5th, Duluth, Minn. 55812.

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**MAKE** Money writing short paragraphs. Information free. Barrett, Dept. C-27-H2, 6216 N. Clark, Chicago 26.

**BIG** Money raising fishworms and crickets. Free literature. Carter Wormery, Plains, Georgia.

**BECOME** A mortgage broker, earn \$10,000 to \$50,000 a year. Details free. United, Box 6284-C, Marietta, Georgia 30060.

**BAKE** New greaseless doughnuts in kitchen. Sell Stores. Free recipes. Michael Ray, Waseca, Minnesota 56093.



**EARN \$240.00** A month at home, spare time, doing only two \$5.00 invisible mending jobs a day. Big money paid for service that makes cuts, tears disappear from fabrics. Steady demand. Details free. Fabicon, 1586 Howard, Chicago, Ill. 60636.

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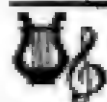
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**BURGLAR** Alarm devices—complete line. Catalog, \$1.00. Sootin's, 321 North-west Third Ave., Miami, Florida.



# Your father never told you there'd be Buicks like this.



'67 Buick GS-400. Engine: V-8. Bore & Stroke: 4.040 x 3.900. Horsepower: 340 @ 5000. Max. Torque: 440 lbs/ft @ 3200 rpm. Compression Ratio: 10.25:1. Carburetion: Single, 4bbl. Suspension: Front - Coil Spring and Ball Joint, Rear - Coil Springs. Steering: Recirculating Ball Nut. Wheels: 14-6.00 "JK". Tires: 7.75 x 14. Fuel Capacity: 20 gallons. Transmission type and final drive ratio: Manual 3-speed 3.36. Available are Manual 4-speed 3.36 and Automatic 2.93. Brakes: Duo-Servo. Available are Front Disc brakes. All GM safety features are standard.







**New, more comfortable cabs!** Choice of 3 interiors. Comfort standard in every one! Extra shoulder room, wider, deeper seats and swept-away instrument panel mean ample space for three.



**Choice of many models!** Standard, Custom or Ranger models available in 6½- and 8-foot bodies with a wide range of power and performance options, including Cruise-O-Matic transmission!



**Exclusive Twin-I-Beam Suspension!** Ford's unique 2-front-axle design combines a durability and smooth action ride that no other front end can match!



**Brand new for '67—Ford Ranger** with top-of-the-line smartness!



# Now! Pickups that work like trucks and ride like cars!

**Everything about them says "tough truck" except the way they treat the driver!**

From the sporty new Ranger to functional new standard models, each gives you the ride and handling you expect only in a car—thanks to the two front axles only Ford pickups have. Yet beneath this smoothness is all the toughness you could ask of a truck. Get to know the special pleasure of owning a new Ford pickup. Get more muscle

to work with, more comfort to go with. '67 Ford—get with it!

**Completely new for '67** • New styling • New foot-operated parking brake • New, longer 131-in. wheelbase • New higher capacity tires (8:15 x 15 4PR on F-100) • New Cruise-O-Matic transmission for manual or automatic 3-speed operation. New F-350's now with Twin-I-Beam suspension, longer 135" and 159" wheelbases, and Camper Special package ideal for mounting up

to 14-ft. camper bodies.

**Plus scores of proven performance and durability features** • Efficient 240-cu.-in. 7-main-bearing Six standard. Husky 300-cu.-in. Six or high performance 352-cu.-in. V-8 available • Fully synchronized three-speed transmission standard • Double sidewall pickup box with all steel floor and easy-to-operate one-hand tailgate latch • Improved rust resistance with extensive use of zinc-rich primers.

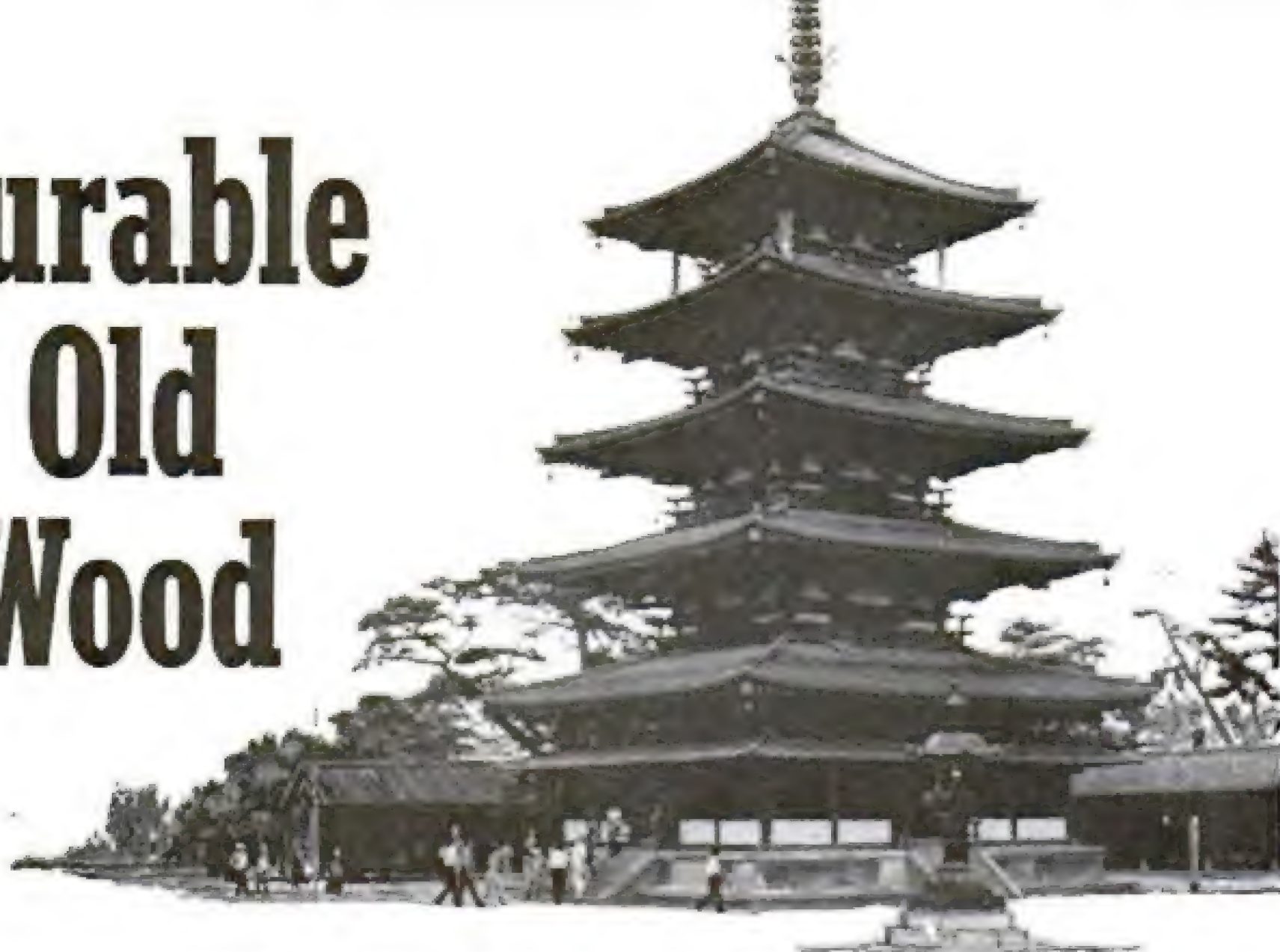
**You're ahead in a FORD**



## All new '67 FORDS!



# Durable Old Wood



REPUTEDLY THE OLDEST WOODEN BUILDING in world, the Horyu-ji Temple in Japan shows few signs of age



EXCEPT FOR THE REPLACEMENT of a few roof supports and half a dozen pieces of decorative hardware on doors, all of the wood (cypress) is original

DEEP IN THE HEART of Japan stands a five-story building that was built more than 1350 years ago, in 607. Located near Nara, the Horyu-ji Temple is reputedly the oldest wooden building in the world.

The ravages of time have dealt kindly with this wonder. Somewhat miraculously earthquakes, fires, wars and termites have bypassed it. Three years before the end of World War II, the pagoda was dismantled and stored away as protection against bombs that never came. (Because of its priceless architectural treasures Nara was one of the few Japanese towns spared bombing during the war.) Seven years later it was re-assembled.

*By A. R. Roalman*



A "NO SMOKING" SIGN, in English and Japanese, and a lightning rod are the only means of fire protection afforded this priceless architectural treasure



607 IS THE YEAR in which the posts of this walkway—like the pagoda—were erected. Nara's temperate climate is believed to act as a wood preservative



*Great new taste,  
rich aroma...  
pipe tobacco does it.*



**Enjoy America's best-  
tasting pipe tobacco  
in a filter cigarette!**

*Product of The American Tobacco Company © 1966*





# This is the start of

This is the start of the '67 boating season. At Evinrude, it happened in March of this year, as Jerry Wallin left the pits on his world-record-setting 130.9 mph speed run. His stock displacement Starflite V-4 engine has a new kind of all-electronic ignition system.

So does the new 1967 Starflite 100-S.

Can you think of a better way to test a new product development?

It's the most advanced ignition system on the market—completely electronic—no breaker points.

The record speed run test with the new ignition system was the most dramatic event in our new product development for '67. But not the only one.

The 9½ hp Sportwin, which set a record of its own last year — a new sales record — is now smoother-running than ever for '67. It trolls as slow as a wall-eye at feeding time.

The 18 hp Fastwin, with a reputation for ruggedness, speed, smoothness, and fuel economy, now has more speed and more miles per gallon.

The 3 hp Lightwin, Yachtwin, and Ducktwin motors



9 new fishing motors under 10 hp!

20 motors from 3 hp to 100 hp!

New Aquanaut diving system

5 new Gull Wing boats

3 matching trailers





# the '67 boating season

now come in both folding and standard shaft models.

The Gull Wing boats are beauties, with a wide range of lively power — 90 hp V-4, 120 hp in-line six, 155 hp V-6, and 200 hp V-8.

The new Skeeter snow vehicles now come in 3 models. We've made 55 improvements to produce the most reliable snowmobile anyone can own. And added a new accessory — the Sleigh-Mate.

The Aquanaut adds a new dimension to boating fun this year. It's the new diving system that lets you breathe underwater with ease — naturally.

It's a great year to own a new '67 Evinrude — for fall, winter, spring, or summer.

You can see many of them at your Evinrude dealer's now. Stop in. And pick up your new Evinrude catalog for 1967. Or send the coupon below.

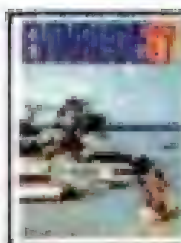
**EVINRUDE**  
**first in**  **outboards**  
*In Canada: Peterborough, Ont.  
 Div. of Outboard Marine Corp.*



3 new Skeeter snow vehicles

New Sleigh-Mate

**FREE**  
**32-page**  
**Evinrude**  
**Catalog.**  
**Send the**  
**coupon**  
**now!**



**EVINRUDE MOTORS**  
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Name.....

Address.....

City.....

State..... Zip.....



# NEW LOOK! NEW BUILD!



**A  
BRAND  
NEW  
BREED  
OF**



# CHEVY PICKUP FOR '67!

Here's the brand new '67 Chevy pickup! It's strikingly new in styling (if it looked any better we'd have to stop calling it a truck)! Lower, sleeker, its trim appearance puts many cars to shame—and so does the bump-smoothing ride!

And there's rugged new construction. A body that resists rust better. A pickup box that's built for added strength. And a color-keyed cab interior that's roomier and offers new safety features such as padded instrument panel and sun visor.

So bring on your tough jobs (and your camping trips)! This one looks so good and is built so well you can use it for almost anything! See your Chevrolet dealer. . . . Chevrolet Division of General Motors, Detroit, Michigan.



# How electronic gadgets are changing football

Telephone lines, closed-circuit TV, walkie-talkies, computers and loudspeakers in the helmets are changing the rules of the game.

BY WILLIAM BARRY FURLONG

**T**HE WASHINGTON REDSKINS were suffering from a soft defense a year or so back. Everyone had been ploughing through them. Suddenly, in mid-season, the opposition was stopped cold. How come?

Easy. The Redskins went to the company that programs war games for the U.S. Army and—at a cost of \$7000—had their defense analyzed by computer. On each Monday, they'd study films they'd shot of the upcoming enemy's offense, break the offense down statistically, and turn the figures over to card-punching personnel at Computer Concepts, Inc. By Tuesday night the punch cards had been fed into computers and the preferences of the upcoming opponents analyzed. For instance, they

**CLOSED-CIRCUIT TV**, with instant playback, lets players see themselves in action during game. Donny Anderson, the 1965 Texas Tech All-American (left), and teammate Tom Wilson study replay





quickly learned that on first down in a spread-right formation, the St. Louis Cardinals were inclined to slant off left tackle. One result: the Redskins won 24-20, for their first victory in six games!

If you think that's slick, try this one:

Last year, the New York Jets of the American Football League took a fast step to help the split ends and the flankerbacks—who now stand 10 to 30 yards to the side of the quarterback—hear the signal call over the roar of the crowd. Quarterbacks often switch plays at the line of scrimmage after sizing up the defense, and it is fairly important for ends and backs to know where they may be going. So the Jets installed a tiny microphone in the noseguard of quarterback Joe Namath, and tucked baby loudspeakers in the sides of his helmet. Whenever Joe barked a signal, the speakers boomed it, like a PA system, to the men out on the flanks. The Jets tried it against the Houston Oilers and won by a handy 41-14.

Today, technology of the great old game of football is not so much a matter of sneaky formations, wily plays or brute strength. Instead, it's a crafty business of walkie-talkies, closed-circuit TV, video tape, computers and electronic skulduggery in the stands. For instance:

Last year, Notre Dame showed up for the Army game with a complete closed-

circuit TV unit. Coaches were assigned to do nothing but watch the three nine-inch Sony TV screens. Army lost, 17-0.

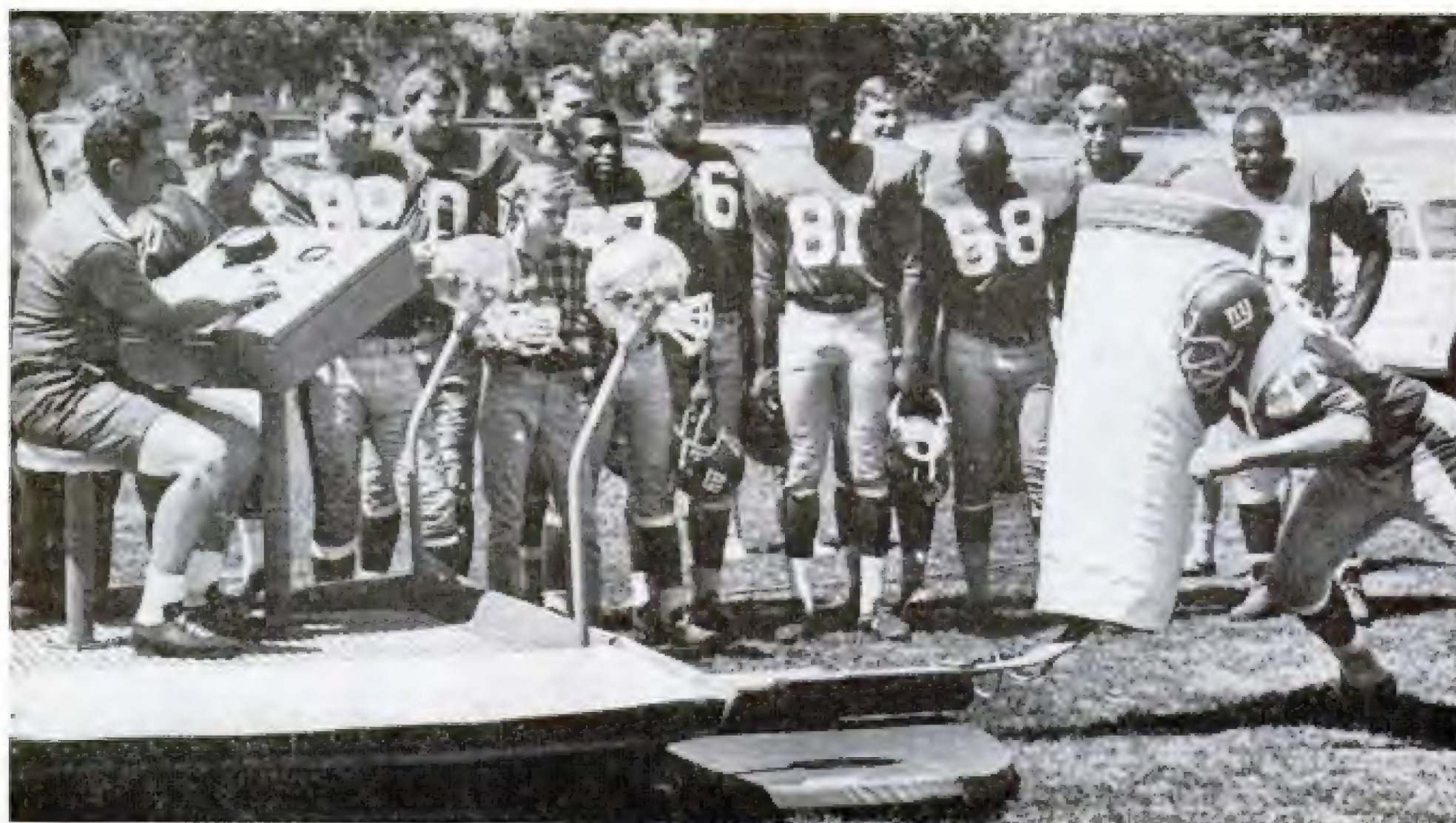
For more than four years, Northwestern has carefully fitted tiny electronic units—accelerometer, amplifier transmitter, antenna and battery pack for power—into the helmet and shoulder pads of the fullback. Every time he receives a blow on the head, the impact is transmitted electronically to receiving units in the press box where the force and direction of the blow is permanently recorded. The aim: to develop a better helmet that will provide more thorough protection.

Last mid-season, Texas Tech came to rely so heavily on instant-replay videotape equipment that it lost one game when it didn't have the equipment available, and barely got by another opponent.

The boom in football technology goes back to the 1930s when movie cameras were first placed in the press box. The intent was to record for future use the techniques and reactions of the opponents and the mistakes of the home team. Some coaches developed intricate grading systems based on the game films, moving a player up or down on the basis of his grades. Movie cameras soon became so important that their use spread with epidemic swiftness. The reason was obvious: There are at least 1000 different

*(Please turn to page 248)*

**ELECTRONIC DUMMY** strikes back at New York Giant tacklers, recording hitting power and reaction time



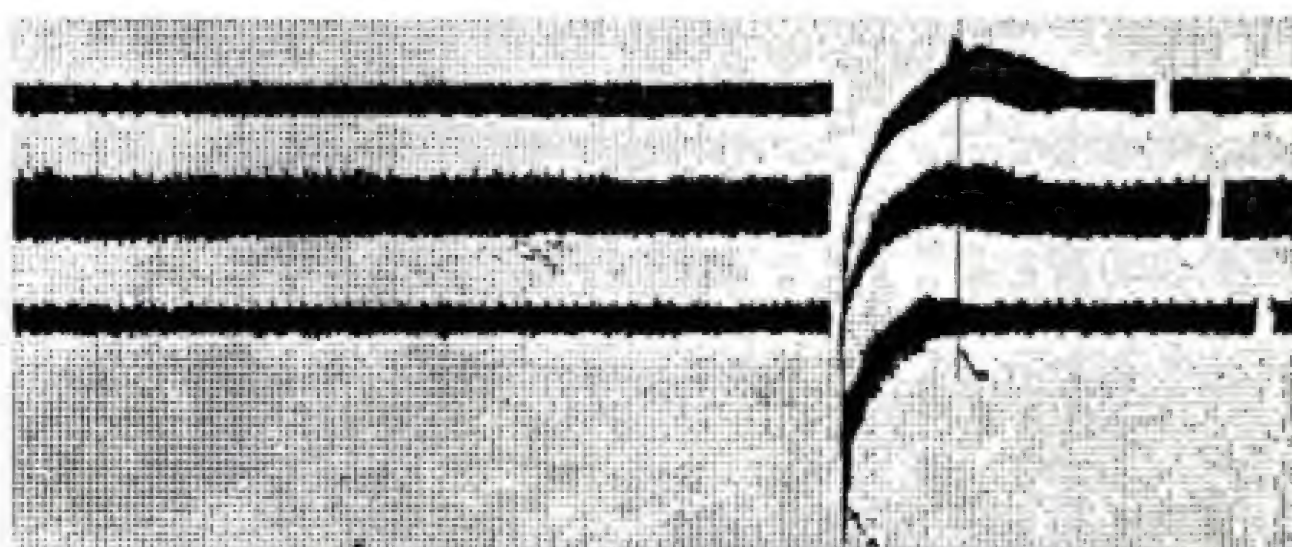




**ARA PARSEGHIAN**, Notre Dame coach and great believer in electronic aids to winning football games, checks TV screen in crucial moment at South Bend

**JOE NAMATH** (see cover), doffs his electronic helmet to listen in on telephone to press box. Telephone on sidelines was one of the earliest electronic aids

**GRAPH RECORD** of fullback scoring touchdown in Big Ten game shows (A) 3660-G impact when hit by linemen and (B) 683-G impact when he lands



**ELECTRONIC GEAR** that records graph is in shoulder pads and helmet of No. 36 (dark jersey). Tests at Northwestern recorded impacts as high as 5000 Gs





# Drivin' with Dan

What's the worst safety weakness of U.S. cars? The hardest speedway to drive? What do they mean by "oversteering"? Answers by America's greatest driver.



**DAN GURNEY** cools off with Rodger Ward at 1964 Milwaukee 200. Ward, two-time Indianapolis winner, announced his retirement after this year's 500, saying racing was no longer "fun".

**Q.** What makes Richard Petty so hard to beat in a stock-car race?—J. P. Smith, Atlanta.

**A.** Richard has a very thorough approach due to his own experience as well as that of his father (former NASCAR champion Lee Petty) and others on his team. On top of that, he is an excellent driver. He and his men know all the tricks of stock-car racing—believe me, there are plenty—and they are not bashful about using them. Then, too, he hasn't exactly been shy of power with those hemi Plymouths.

**Q.** What is the biggest safety weakness of U.S. cars?—Oscar Ball, Waterloo, Iowa.

**A.** They sacrifice handling and agility for a "soft floating ride." They are also a bit on the heavy side (our European friends usually

use much stronger words). Weight and the beef that goes with it is sort of an asset if you plan to be in an accident, but on the other hand it probably makes an accident more likely to occur.

**Q.** Is it true that USAC won't permit championship cars to race at Daytona because they know they'd go faster than they do at Indy and USAC wants to maintain the illusion that Indy is the fastest track in the United States?—C. D. Dyer, Orlando, Fla.

**A.** I doubt it. Frankly, I believe they found the Daytona track and its speeds (lap speeds of over 170 mph in roadsters several years ago) contributing to some rather mysterious accidents, and I don't think anyone is super-anxious to go back.

**Q.** What's the hardest thing about racing in several kinds of cars—Formula 1s, GTs, stocks and Indy cars? How can you adapt quickly from one to another?—Joe Blake, Pasadena, Calif.

**A.** The hardest part is to arrange it so you can arrive at a circuit or track and find your car all sorted out and up-to-date, handling well, and up to snuff on power, brakes, etc., with a good experienced crew to maintain and service it for you. Adapting is relatively easy if the car is right.

**Q.** What do they really mean by "oversteering" and "understeering"?—Phillip Jones, Amherst, Massachusetts.

**A.** A car steers more than it should with a given amount of movement of the steering wheel when it oversteers. It steers less than it should with the same given amount of steering wheel movement (or it wants to go straight) when it understeers.

**Q.** Will the safety scare put a crimp in auto racing?—Peter Sand, Holland, Mich.



**A.** I don't understand your question. The idea seems completely illogical to me. Racing breeds safety in motoring.

**Q.** A safety expert recently said that fastbacks are a step backward in visibility. Do you agree?—Paul T. Miller, Ponca City, Okla.

**A.** That depends on how well you can see out the back, not on the shape or silhouette of the car. In other words, if the fastback were all glass, without distortions, then you would have tremendous visibility. There are quite acceptable compromises, of course.

**Q.** I understand that when Rodger Ward retired, he remarked that racing was no longer fun. Is it still fun for you?—Art Blake, Muskogee, Okla.

**A.** Winning in any kind of competition is fun to a competitive person. Competing against the acknowledged best in the world seems worthwhile to me. Sports, including racing, have led the way in human relations among people of the world in a way from which politicians could well take a page. I certainly do enjoy racing, especially when I win.

**Q.** Why are sports-car pit crews so slow and so sloppy?—Charles L. Garner, Burlington, Vt.

**A.** Pit stops are not necessary in most races for sports cars. Competition will force them to become more efficient crews if pit stops become part of the game.

**Q.** What's the hardest big speedway to drive?—Glenn Runyan, Raleigh, N.C.

**A.** It may change from one day to the next, depending on the weather, track conditions, what sort of car you are in, etc. I understand Darlington is tough. I haven't driven there. Langhorne is another one I've missed that sounds tough. Spa, Belgium, in the rain is pure hell. Any road race in the wet is bad news, believe me. Daytona offers a unique problem when you have closely matched cars on its super-fast banks.

**Q.** Lately, cars with automatic transmissions have been beating cars with manual shifts in the Super-Stock classes. If this is true, where is the case for shifting?—Jerry Nelson, Rock Island, Ill.

**A.** Have you joined the "stampede" to electric toothbrushes? Do you believe there is a case for sailboats? Has homemade bread been stamped out? They haven't made shift-

ing obsolete in GP racing, but if automatics ever prove to be better, then I'll change. Despite the success of automatics in special drag racing (AFX, Super Stock) where you gain extra strength and a little insurance on greater elapsed times, the manual transmission remains a much more versatile one.

**Q.** During the rush hour, maneuvering room in freeway traffic is at a minimum. How can I shake and/or discourage a tailgater?—Jim Fairbanks, Sherman Oaks, Calif.

**A.** This is a tough problem. If he is really climbing all over you, I suggest gradually slowing down and then waving him by. I don't believe it is wise to try to "teach him a lesson." Let discretion be the better part of valor.

**Q.** On wet pavement in slow traffic, a "panic" stop locks the wheels. Is there anything I can do to avoid smacking the car in front of me?—K. B. Rowan, Orange, N.J.

**A.** The best thing to do is experiment. Make some stops on wet pavement without any other cars around—panic stops and subpanic stops. Find out how your car stops on different surfaces at different speeds with varying amounts of water on the road. You will soon find out how closely you should be following cars or approaching situations requiring a potential sudden stop. Any kind of panic stop means that you had the situation incorrectly assessed and didn't give yourself enough room to cover all contingencies. In other words, you were driving badly.

**Q.** If I wanted to buy one, how much would one of your All-American Indy-type cars cost?—Mickey Fisher, Palo Alto, Calif.

**A.** Approximately \$50,000 complete, less spares.

**Q.** What's the best all-round street/track sports car you've ever driven?—Walter O. Eastman, Kenilworth, Ill.

**A.** A GT 350 Mustang.

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If you have questions on racing, high-performance and everyday driving techniques, send them to "Drivin' with Dan," c/o Popular Mechanics, 575 Lexington Ave., New York, N.Y. 10022. Questions cannot be answered by individual letters. Questions on maintenance and repair should be addressed to the Auto Clinic (see page 23).

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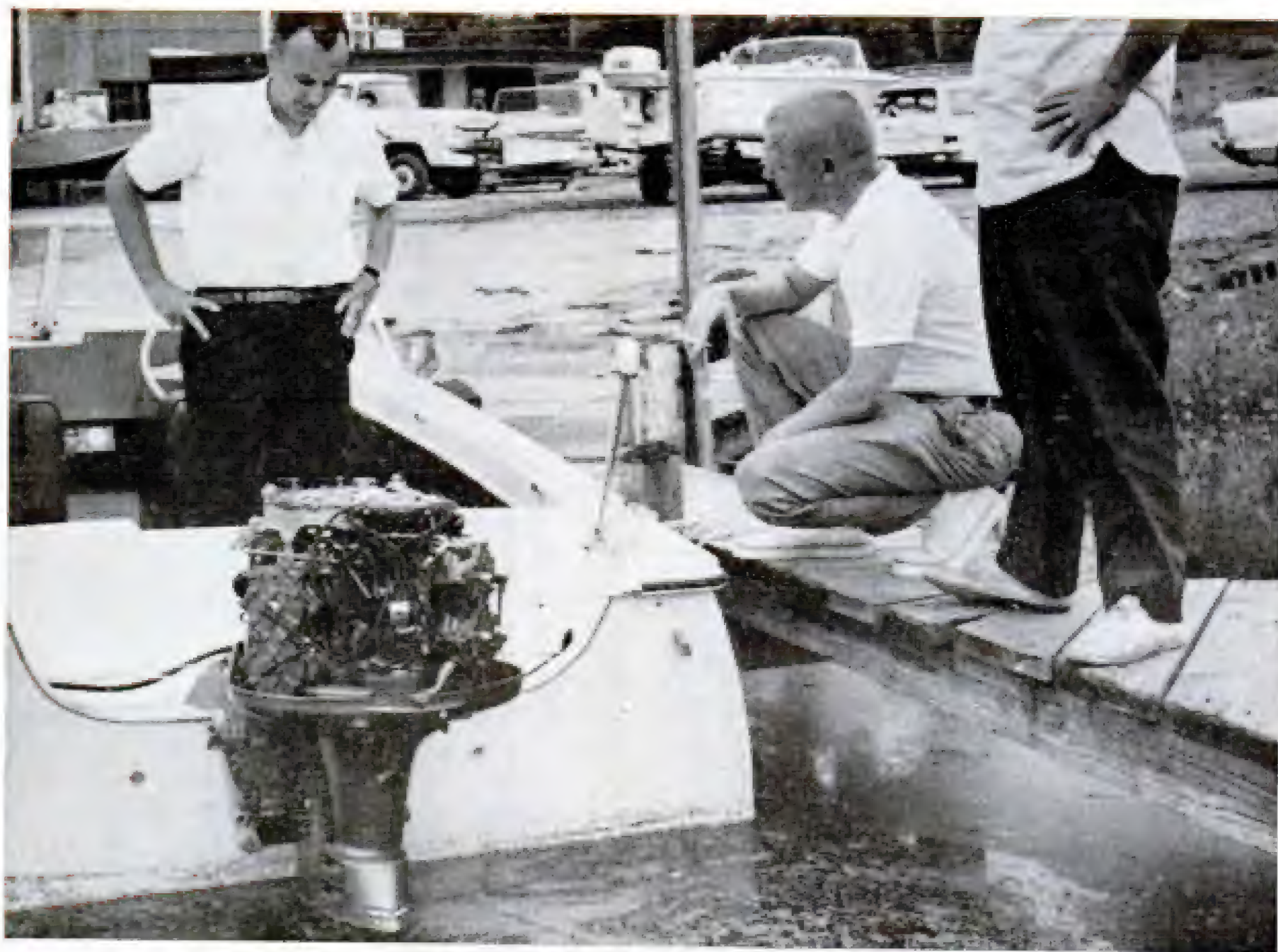


# '67 OUTBOARDS... Jazzed-up looks and performance

Electronic ignitions for a smoother purr, more engineering tricks for tougher wear and styling dazzle for more customers—they're all in the new line-up

BY ART MIKESELL, PM's Boating Editor

**B**IGGEST NEWS BY FAR this year is the spread of electronic ignitions. Merc started the ball rolling last year by offering Thunderbolt ignition as standard equipment on the six-cylinder, 95-hp 950SS and 110-hp 1100SS. The company billed this as, "the first major breakthrough in outboard ignitions in more than 50 years." Apparently the buying public agreed, for this year Merc will offer Thunderbolt ignition on two mid-range motors as well, the 50-hp 500SS and the 65-hp 650SS.



## Johnson

In a power range that has been basic to the Johnson line for many years, the 80-hp Super Sea Horse is offered in two models. The Electromatic (shown) has a single lever for fully automatic shift and throttle control. The conventional model has separate controls for throttle and shift. New for '67 in the 100-hp outboards is an all-electronic ignition. Johnson also offers a top-mount control for models ranging from 3 to 9 hp so they can be used on sailboats.



In addition, both Johnson and Evinrude are introducing electronic ignition systems on their top-of-the-line 100-hp models.

Electronic ignition produces a much stronger spark than a conventional system, and does it many times faster. Its advantages are well-known—virtual elimination of pre-ignition, much longer plug life, no breaker points to replace and greater operational efficiency and reliability, to name a few. With so much going for it, there's a better-than-even chance that electronic ignition will become even more widely available in the next couple of years.

But electronic ignition isn't the only new development this year. Here's a company-by-company look at the rest of the 1967 outboard picture:

**EVINRUDE.** In addition to electronic ignition on the Starflite 100-S (which, incidentally, set a new world's outboard speed record of 130.9 mph this year), the company is adding three standard fixed-shaft 3-hp models to its 1967 line, supplementing the folding 3s introduced last year. Also new this year are adjustable transom brackets for all four-cylinder models which allow 2½ inches of vertical adjustment so you can mount the motor at exactly the right height for any hull.

New styling for 1967 is a triple-threat approach—80 and 100-hp models will be

## Chrysler

Ratio of .41 hp per pound is a level never before achieved in outboard of new Chrysler 55's class, the manufacturer says. The electric-start standard two-cylinder model weighs 134 pounds. It's one of 27 models available for 1967.



## Mercury

Thunderbolt ignition, standard on six-cylinder 110-hp 1100SS (shown) and 95-hp 950SS is being offered this year on the four-cylinder 50-hp 500SS and 65-hp 650SS. Also new: electronic accessory to counteract electrolysis. It's called the MerCathode.







## Evinrude

Speedifour (above) is Evinrude's economy model in the 80-hp class. It has snap-action mechanical shift in place of electric pushbutton control found on deluxe Starflite. Speedifour has electric start, choice of five props. The 33-hp Ski Twin (left) comes in two models, the key-turn electric-starting model and a manual-starting model. It's an "all-purpose family motor"

metallic gold; 33 through 60-hp models will be white with blue and red accents; while the smaller motors will retain that traditional Evinrude blue styling.

There are also dozens of hidden nuts-and-bolts improvements. The low-profile 9½ Sportwin, for instance, has a completely new suspension system, plus new carburetion for improved low-speed operation. The 6, 9½ and 18-hp models will all have new fuel pumps. And like that.

*The 1967 Evinrude Line—various models with the following horsepower ratings: 100, 80, 60, 40, 33, 18, 9.5, 6, 5 and 3.*

**MERCURY.** Most important change, of course, is the addition of two more models with Thunderbolt ignition, but Merc also has plenty of news for '67. The 650, a nominal 65-hp motor, has a slightly increased displacement for extra power. And all the new Mercs will be equipped with new longer-reach sparkplugs which provide more thread engagement for better heat dissipation and more reliable sealing.

An interesting new accessory introduced this year is the MerCathode, a solid-state electronic device for use with any outboard or stern drive which automatically provides exactly the right amount of electrical current to counteract electrolysis.

*The 1967 Mercury Line—nine models in the following sizes: 110, 95, 65, 50, 35, 20, 9.8, 6 and 3 hp.*



## Sears

Low-silhouette 45-hp Sears outboard is equipped with alternator-generator, remote fuel tank and auto-bail pump. New from Sears for '67 is electric starting for the 7½-hp and 9-hp models, complete with a plastic battery box/carrying case.



## Homelite

Still the only four-cycle outboard available in the United States today, Homelite's 55-hp motor remains basically on Boston Whaler, made by Fisher—unchanged for 1967. It's shown here



**CHRYSLER.** The new Chrysler 55, one of 27 models in the 1967 line, is described by the company as "an engineering 'first' in outboarding." The electric-start standard model of this lightweight two-cylinder weighs only 134 pounds (alternator models are slightly heavier), achieving a ratio of .41 hp per pound, which, according to Chrysler, is a level never before achieved on an outboard in this power class.

Two other big guns in the '67 line are the 9.2-hp and 20-hp Autoelectrics. Featuring key-switch starting, each has a built-in generator which will provide up to 10 amps of power for lights, bilge pumps and other accessories, plus a unique 360° dome light atop the motor. If desired, Chrysler's Autoelectrics can be started manually and operated without the battery.

Chrysler is losing no time in improving and modernizing the West Bend Outboard facilities which it acquired last year when the auto maker decided to go into the outboard business. A major expansion program announced last June will double present production capacity by June, 1967. Considering that this will bring capacity to about four times what it was in January, 1965, when Chrysler was in the process of purchasing West Bend, it would seem that those men from Detroit are seriously aiming for a bigger share of the market.

*(Please turn to page 232)*





**An old-fashioned sleigh ride** in contemporary style is offered by the Cutter, a tag-along accessory for Johnson Skee-Horse snowmobiles. The fiberglass sleigh rides on two skis, which are mounted on springs for a smooth ride. It'll hold two passengers.



**Pushbutton starter** for a chain saw provides a new convenience for the user of a lightweight gasoline-engine-powered chain saw. The starter is on McCulloch Corporation's new MAC 3-10E saw which has a built-in starter-generator and battery combination. The entire unit weighs less than 14 pounds.



**18th Century Parisians** would recognize this balloon immediately. It's a replica of the hot-air bag that the Montgolfier brothers flew in Paris in November, 1783. Built by apprentices at the Hawker Siddeley Aviation works, the replica is a  $\frac{1}{10}$ -scale model of the original, with a diameter of 35 feet. The heat source is an industrial oil burner. The passenger platform, made of laminated wood with a metal floor, holds one person.



# 1967: THE SHOWDOWN YEAR

By BILL KILPATRICK  
*PM Automotive Editor*

**T**HE 1967 MODEL YEAR finds the U.S. auto industry entering one of the most critical periods in its long and gaudy history.

Confronting auto makers as new models hit the market are such problems as sagging sales, an inevitable head-on clash between the concepts of high performance and safety, a swelling chorus of owner complaints about shoddy workmanship, and—perhaps most surprising—the fact that styling per se seems to be losing its once-magic appeal to car buyers.

How these and other problems piling up on Detroit's doorstep are going to shake down is anybody's guess. Some industry observers see 1967 as a banner year. Others fear the long-standing romance between Detroit and the U.S. motoring public may be cooling, or at least needs a shot in the arm.

PM's observations and inquiries indicate that regardless of how things turn out, 1967 will prove a showdown year—a year during which auto manu-

OCTOBER 1966

G.M. SALES HURT  
BY SAFETY ISSUE

**Doctors Picket  
For Auto Safety**

*Ribicoff Accuses Auto Makers  
Of Arguing 'Safety Doesn't Sell'*

**Owners like precise  
handling, deplore  
workmanship**

*GSA Adopts Stiffer  
Auto Safety Standards  
For Government Buying*

**Buyers May Find Bargains**

**Hotter Car Competition  
Is Likely, With Styling  
The Principal Weapon**

*AMC Is Shaping Major  
Changes in Its '67 Cars;  
Sees Acceptance Vital*



facturers and dealers will jump through hoops to move merchandise.

## Showdown on sales

Sales—that's where the action is right now and will be in the months ahead. Hoped-for volume looks chancy at the moment.

"The usual new-model enthusiasm will carry the industry through the Christmas holidays," one high-placed and gloomy auto executive told *PM*. "But after that, sales are going to sink out of sight."

Less pessimistic versions of this same theme can be heard up and down any number of Detroit hallways. And to meet this anticipated slump, these same hallways ring with elaborate plans to woo you into dealer showrooms.

Also aimed at needling buyer interest are pending so-called "half year" model introductions. Pontiac will probably pop after the first of the year with a new "sporty" entry based on GM's new Chevy Camaro. Thunderbird may offer a convertible along about spring. Mercury is said to have a surprise in the works. Right now Plymouth is holding back its new Barracuda until next month, the theory presumably being that hoopla over the Camaro and Cougar will have died down by then, leaving the announcement stage free for a solo act.

As the U.S. economic bellwether, the auto industry is sensitive to shifts in foreign policy, international trade agreements and restrictions, Vietnam, tight money, non-industry-related slowdowns,

cutbacks and labor trouble, and so on. For Detroit to sell cars, people must have or be able to borrow the money to pay for them. So look for industry efforts this year to be aimed primarily at speeding up and keeping the entire ball rolling.

## Showdown on styling

More than ever before, industry output tends to look as if it came from the same set of cookie-cutters, thus placing auto makers in a somewhat awkward fix. Here they are, entering the stiffest competitive battle in industry history, and all are armed with pretty much the same weapons. Play-it-safe, look-over-the-other-guy's-shoulder styling has made relative individuality in your car increasingly hard to come by, even with the maze of available options. Buyers are taking note and snorting out loud. Despite the gimmicks, many potential buyers say choosing between competing makes in most price levels is a tweedledum/tweedledee situation. A case in point is AMC's "all-new" Rebel.

Viewed from any angle, anyone other than an out-and-out car buff would have trouble distinguishing the Rebel from its GM, Ford, and Chrysler Corp. competition. All current styling "themes" are present—dual headlights, horizontal grille, wrap-around bumpers, a mild fender "hop up." AMC says it built the car from scratch. If so, it seems logical to ask why it doesn't offer buyers styling they can't buy anywhere else.

This "me, too" styling philosophy finds the industry trying to entice customers

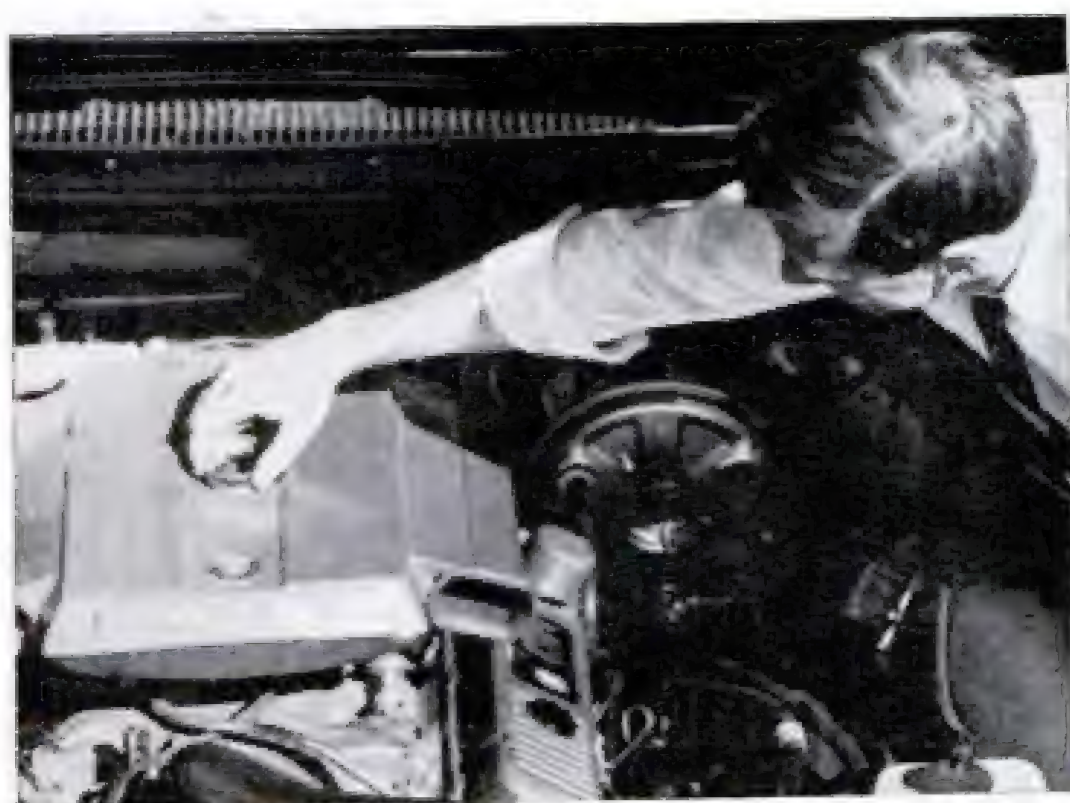


**REBEL** by American Motors is epitome of look-alike styling. Car is all-new, yet lacks distinctiveness





**MERCURY** still hasn't figured out how to stow the optional shoulder harness. This arrangement is bad



**BUICK** optional fiberglass air cleaner is attempt to bring styling (are you ready?) to the powerplant

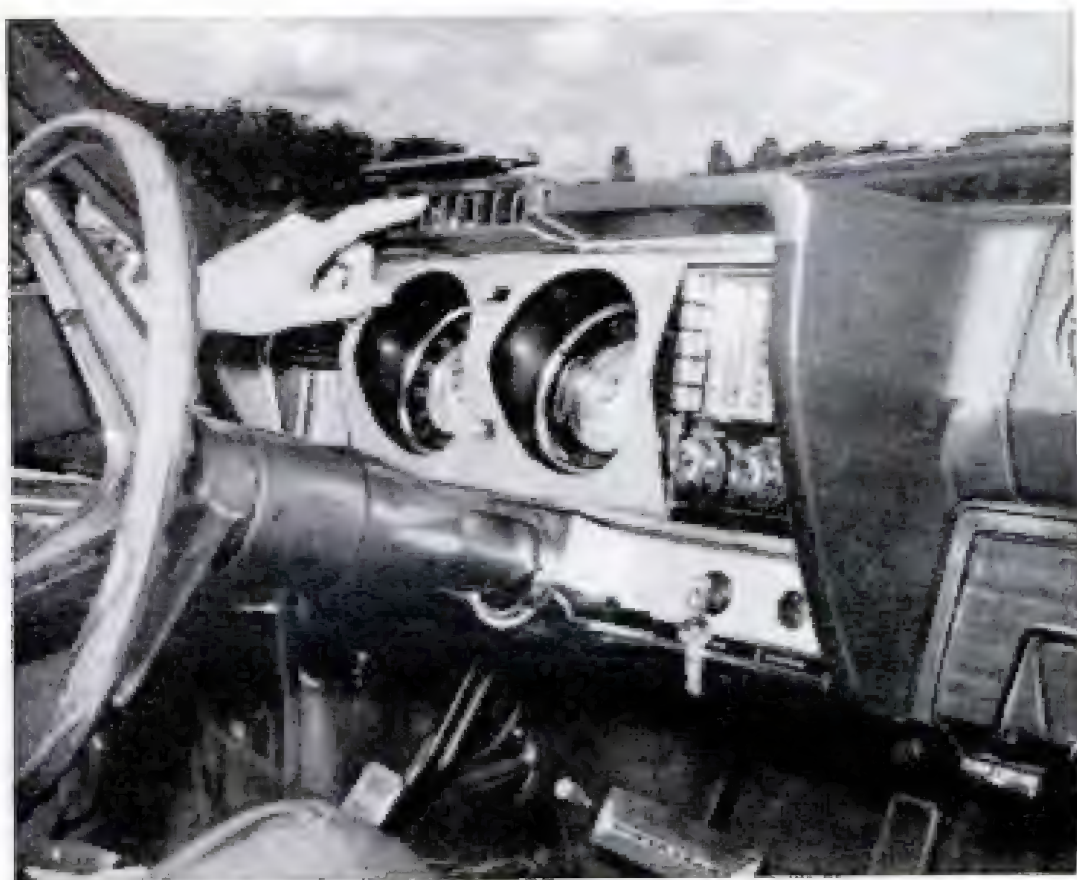
with such specious competitive arguments as Dodge's claim that its Dart is "the biggest compact in the industry," a non sequitur that—if followed to a reasonable conclusion—would have rivals, like little kids, claiming "my compact's bigger than your compact." Buyers are becoming too discerning and choosy to swallow this sort of nonsense straight.

Perhaps without intending to do so, Ford Div. headman Don Frey may have summed up Detroit's styling thinking when—during an informal luncheon talk before a group of magazine writers early last summer—he cited as being significant factors in Ford's successful year a number of what he termed "tremendous trifle innovations." And he's right: When you come right down to it, manufacturers are offering trifles. In the past buyers have settled for this. Will they continue to? Detroit is beginning to wonder and the answer could be an important part of this showdown year.

## Showdown on performance

Whereas Detroit once showed every sign of becoming an exotic zoo—Skylark, Impala, Marlin, Wildcat, Barracuda, Mustang and the like—it now threatens to become an alphabet soup—GTO, SST, GTX, SS, R/T, GT and so on. This often improbable mix of letters (and/or numbers) spells one word—*performance*, a Detroit euphemism for cars that go like a bat.

Recent marketing emphasis has been on cars à go-go, with all manufacturers



**AMBASSADOR** airconditioning outlet is situated at face level for most drivers. Comfort, sil Sinus, no!

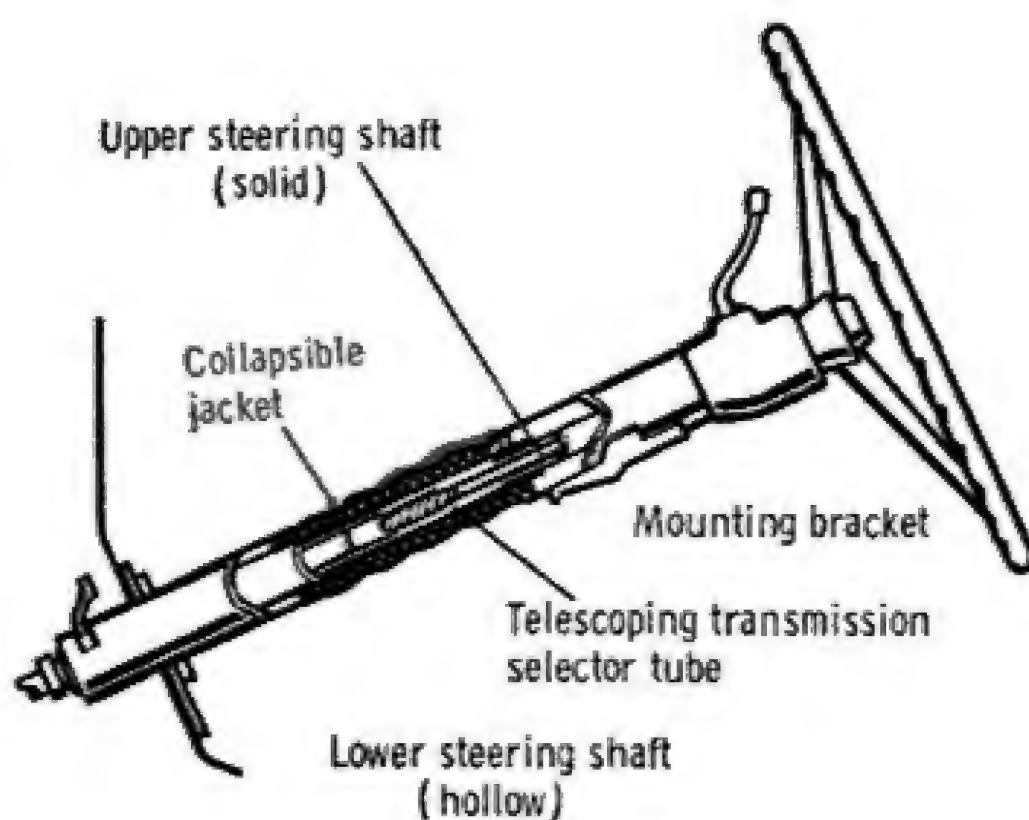


**WIDE-TREAD TIRES** (here on Cyclone GT) this year are a performance option throughout most car lines



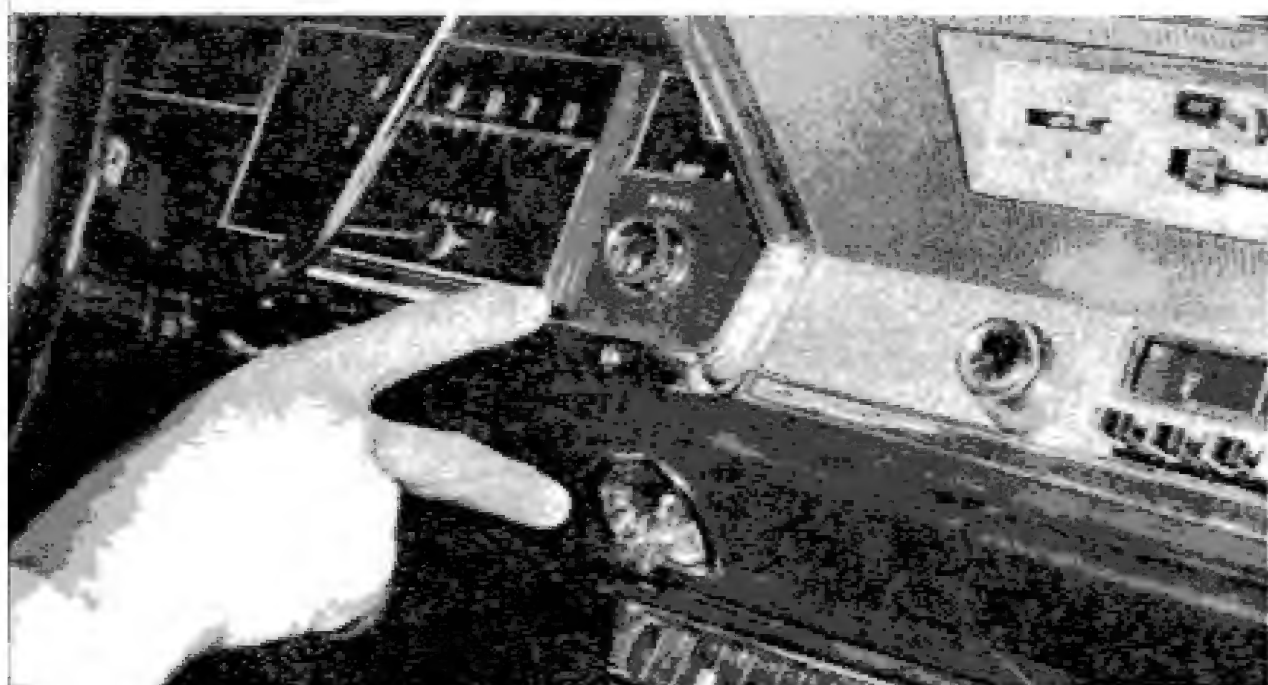


GM is featuring self-locking front seats on all lines. Seats tilt up when lock is released



#### ENERGY-ABSORBING STEERING COLUMN

soaks up collision impact, collapses from top when struck by driver's chest. Unit, made by GM, is used throughout industry except by Ford, which offers deep-dish idea



**RECESSED CONTROL KNOBS** and instruments are a safety highlight of all the '67 cars (shown here in a Valiant Signet). Note the "swept away" cant of the dash panel, still another safety feature of most '67s

offering "hot" engines and what auto men call "a handling package." This year the variety of performance "packages" is greater than ever.

Plymouth's new GTX is typical. It's a "hot" Belvedere powered by a 375-hp, 440-cu.-in. V8 with 4-bbl. carburetion, special cam, and dual exhausts. You can also order the car powered by the even hotter "Street" Hemi, an only slightly tamed version of Chrysler Corp.'s great racing engine. Suspension and brakes are heavy duty. Front disc brakes are optional. The transmission can be either heavy duty automatic or four-speed manual featuring a beefed-up clutch. No effort has been spared to identify the car as a high-performance machine—simulated air intakes on the hood, optional racing stripes, wide-track tires, bright exhaust outlets, all sorts of racy-looking nameplates—even what one Plymouth engineer referred to as a "sporty flip-open gas cap." A really startling feature of the car is that its speedometer registers 150 mph—a frightening thought. The manufacturer says the 150 mph figure is to "accommo-

date drivers in competitive performance events." Like the San Diego Freeway? The Jersey Turnpike? A quick dash to the supermarket? Even more frightening is that anyone—yes, *anyone*—can walk in off the street and buy this or any of the other performance offerings.

So, while buyers obviously want more zip and dash (possibly as a backlash of look-alike styling), the question arises as to whether or not the average motorist can handle it properly. Driver goofs in the avowed hot ones feeds potent ammunition to those who snipe at Detroit for "building unsafe cars."

Thus performance has in a way backed Detroit into a corner. All-out for what Oldsmobile general manager Harold N. Metzel calls "the youth market," auto makers this past spring felt the full impact of the safety controversy. Suddenly they were all over egg, a happenstance that caused one Ford engineer to lower his voice during an enthusiastic recital of the GT's muscular virtues to point out that for 1967 the speedometer was red-

*(Please turn to page 245)*





# The really new ones

**Camaro chases a Ford horse and Cougar blazes its own trail**

**T**HE ADVENT OF A NEW CAR—a *really* new car—is always headline news in the world of automobiles. Last year the big newsmaker was the Toronado. This year the industry is introducing *three* really new ones—Cadillac's front-drive Eldorado, Chevrolet's Camaro, and Mercury's Cougar.

As pointed out in the section covering luxury cars (pages 124-125), we have no official information concerning the Eldorado. But regarding the Camaro and Cougar, we're loaded. We've seen and driven them both and come away from the experiences—each unique in its own way—convinced the U.S. car-buying public will respond to these cars as enthusiastically as we did when we first climbed in them.

**CAMARO:** This is Chevy's long-awaited entry in the low-priced personal car field. Tabbed since its inception the "F-Car" by GM and the "Panther" by everybody else—including the competition—it's the car Chevy rushed to market when it became painfully apparent even heated-up versions of the Corvair were no match for Ford's front-running Mustang. But there's nothing "rushed" about the final product; it's a tidy, handsome, and spirited little car that should warm the hearts of all Chevy enthusiasts.

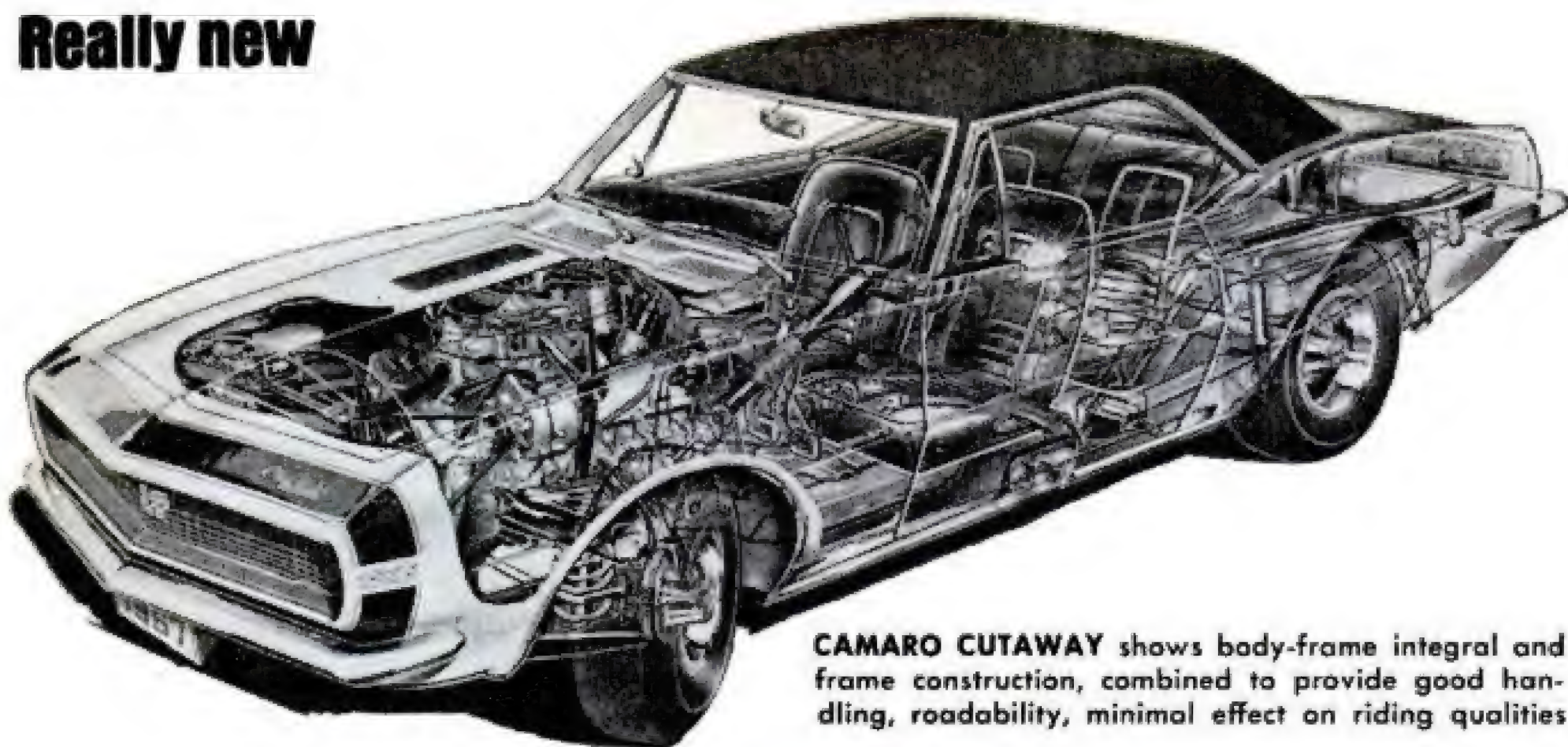
From a general styling point of view the car pretty much emulates the "long-hood, short-rear-deck" lines of the Mustang, with which it will inevitably be compared, particularly during its first few months on the market. In a side view, both cars are very much alike. But front and rear and inside,

## Camaro

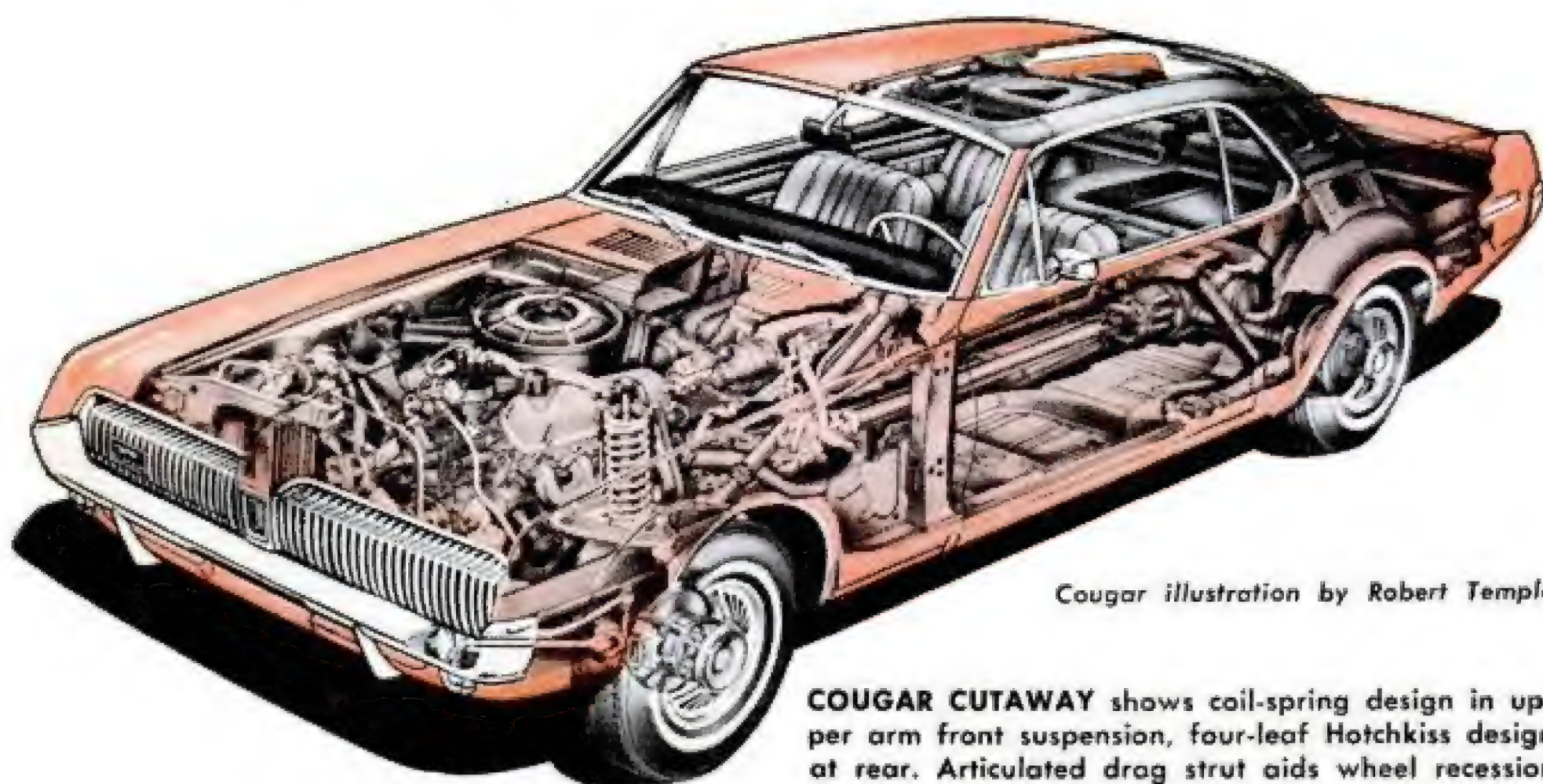




## Really new



**CAMARO CUTAWAY** shows body-frame integral and frame construction, combined to provide good handling, roadability, minimal effect on riding qualities



*Cougar illustration by Robert Temple*

**COUGAR CUTAWAY** shows coil-spring design in upper arm front suspension, four-leaf Hotchkiss design at rear. Articulated drag strut aids wheel recession

things become distinctly Chevy Camaro.

Immediately apparent is the car's gently sloping hood, dropping off up front in a neat, if conventional, headlight and grille arrangement. In what is called a "rally sport package" version, the headlamps are concealed behind electrically operated covers that are part of the grille. Yet another optional "package"—the SS (for Super Sport) 350, bluntly termed by Chevy a "performance road machine"—features a wide "bumblebee" paint stripe around the front panel and fenders (see color photo).

The idea behind offering the car in such a variety of "packages" and with a long list of comfort, appearance and performance options seems to be to blanket Camaro's end of the personal car market

with everything from a nice, plain and docile Six to a plush, gaudy and fire-breathing V8. The former will presumably appease the Little Woman, the latter the tiger in us all.

Available transmissions for the Camaro include three- and four-speed manuals and Chevy's well-established Powerglide. Shift controls for the three-speed manual and the automatic are mounted on the steering column unless an optional console setup is specified. All four-speed manuals are console-mounted and in the SS 350, regardless of transmission specified, console mounting is standard.

New this year and available only on the Camaro is a 350-cu.-in., 295-hp V8 demanding the beefed-up suspension components featured as standard equipment





▲  
**CAMARO**, Chevy entry in the personal-car field, is a staunch handler in performance "package" versions. Standard engine puts out 140 hp, highest option 295. Car comes as either a two-door coupe or convertible

**COUGAR** is called an intermediate-class personal car, fills market gap between Mustang and T-Bird. Basic engine puts out 200 hp, highest option a brisk 320. Car is available only in four-seat hardtop ▼





## Really new

in the SS 350 version. It's a true dazzler.

Front disc brakes are optional in all Camaro models as are a host of interior trim "touches," some conceivably attributable to added safety, some to pure flash.

It's a nice car. You're going to like it.

**COUGAR:** This pleasing new entry by Mercury takes dead aim on an heretofore relatively unexploited area—the *medium-priced* personal car market. Mercury refers to the Cougar as "an exciting specialty car with a strong luxury/sports influence." And that about sums it up; it is exciting (though mildly), certainly a specialty car, luxurious, and the dominant influence is definitely sporty.

Here, too, the principal styling theme is the "long-hood, short-rear-deck" concept first offered as such by Mustang. But be assured the overall result is much more than merely a bigger version of Ford's highly successful oat-burner. The lines are clean and uncluttered by tacked-on chrome gewgaws. The hood marches right out there and drops off sharply in a ver-



**CAMARO'S** engine has the appearance of being almost amidships. Unique position is due to elongation of hood. Extension also serves as impact-absorber

tically-styled "waterfall" grille. This same "waterfall" theme is repeated in the back, the most prominent feature aft being provision for sequentially-flashing taillights. Standard thin, dual paint stripes just below the beltline run the entire length of the car. Headlamps retract behind vacuum-operated grille covers.

# Compacts: the hot ones

## While Barracuda's away, the cats are at play

**T**HERE WAS A TIME when the theory of "compact" car design was based on small size, function and economy. But Detroit has apparently long since left this market to VW-type people. The result is that—after emerging from the melee of

lines, series and models from each manufacturer—we are forced to define compacts as hot or calm. Perhaps next year we'll have a lukewarm category.

From what should be a discussion of Three Hot Musketeers among the com-

### THE REALLY NEW ONES JOIN THE LITTLE HOTSHOTS—HOW THEY COMPARE

Car	Wheel-base (in.)	Track (f/r, in.)	Overall Length (in.)	Overall Width (in.)	Engines in Model(s) Series (Displacement, cu.-in.—V8 except as noted—carburetion)
Chevrolet Camaro	108.1	59.0/58.9	184.6	72.5	230-6-1bbl., 250-6-1bbl., 327-2&4bbl., 350-4bbl.
Mercury Cougar	111.0	58.1/58.1	190.3	71.2	289-2&4bbl., 390-4bbl.
Ford Mustang	108.0	58.9/58.0	183.6	70.9	200-6-1bbl., 289-2&4bbl., 289-4bbl., HiPf., 390-4bbl.
Rambler American (Rogue)	106.0	56.0/55.0	181.0	70.84	199-6-1bbl., 232-6-1&2bbl., 290-2&4bbl.





**REAR-SEAT LEGROOM** in "personal-type" cars (here in Camaro) tends to be somewhat cramped. Style is true two-seater, rear seat a "family man" concession

Inside is a surfeit of padding—instrument panel, door panels, roof rails, sun visors and so on. Even front-seat backs are padded to protect rear-seat passengers. Other interior styling effects are luxurious, some even functional. Bucket seats up front are standard.

Cougar transmissions include a three-



**CAMARO** styling goof (we think, anyway) is a bright chrome inset on certain model steering wheels. Sun reflection under right conditions can be blinding

and four-speed manual and a three-speed automatic Ford calls a "sports shift," a personally-annoying feature of which is that when you downshift, the car must slow to, say, 35 mph before the lower gear becomes effective, thus negating (to my mind, anyway) the reason for down-

*(Please turn to page 238)*

pacts, we have been reduced to two by Plymouth's sitting tight on releasing what will be a highly refined Barracuda. It's scheduled to be announced next month.

**MUSTANG:** Ford is placing its money on the by now "traditional" Mustang styling to meet Camaro's challenge. Styling changes are picayune—just enough to dis-

tinguish the '66s from the **the 67's** '67s. Aircraft buffs will probably recognize the simulated air scoops on the side panels: They bear amazing resemblance to the air intakes on jet fighters of the early 1950s.

If you're a true Mustang devotee, you'll

*(Please turn to page 238)*



**ROGUE** can step out smartly with AMC's 225-hp, 4-bbl. "Typhoon" V8, the engine the manufacturer introduced last year in belated high performance effort



**MUSTANG'S** new fastback offers improved rear-seat headroom, but not much; clearance for a six-footer is still a bit tight. Legroom aft remains—uh—snug



## The hot compacts



## Compacts: slightly cooler

The so-called "compacts" are growing bit-by-bit. Some wheelbases are longer, some tracks wider, a few interiors bigger all around. And, to keep pace with their burgeoning growth, engines are being stepped-up in size and muscle



DART features new sheet metal, other styling changes. Car retains cleanly styled look. Powerplant options remain the same as last year



FALCON styling is pretty much a holdover from '66 with model line-up unchanged. Two-way tailgate is offered as option on all station wagons





▲ **ROGUE** convertible heads Rambler American series, stacks up as a lively performer in 225-hp engine version. Car charges through corners in style and "settles" nicely

◀ **MUSTANG** offers a new 2+2 fastback this year. Car is bigger than previous models, features optional fold-down rear seat for long floor load space, new rear styling

**CHEVY II** features new front fenders and grille. Inside, there's a new steering wheel, new seats and sidewall trim. Standard and optional power trains are the same as '66 ▶



**VALIANT SIGNET** tops series line-up of eight models. All feature new body, wheel-base up two inches to 108. Outer dimensions remain the same. Interiors are roomier ▼





## Cooler compacts



**CORVAIR**, little changed for 1967, may go way of the La Salle and De Soto if Camaro is a smash success

**C**OOL, CALM AND COLLECTED in the chart opposite are the 1967 vehicles still designed to fit in 1930 garages. They all log in under 190 inches in length—except the Dart of course, “the biggest compact in the industry.” (Other compact-car manufacturers could check a few di-

mensions inside and out and quickly reveal the “smallest compact” in the industry, but the Detroit manufacturer who finds he wins the smallness prize would probably do all he could to hide the fact.) So here they are: the biggest-little cars that—regardless of the size hassle—still size

# The solid citizens of Detroit

## These “Mom and Dad” entries can also be real marchers

**F**OR PUBLIC CONSUMPTION, automakers will be the last to admit that the so-called standard family car is going the way of the dodo bird. But privately, a number of industry executives say that if present marketing trends and buyer preferences continue along lines similar to those of the past few years, this particular category of cars may well fade from the American motoring scene as surely as fender wells and side curtains.

Behind this potential demise is the fact buyers who would normally show interest in a “family” car tend to either move up to the out-and-out luxury offerings, scout around among the sportier intermediates, or go all-out station wagon. It’s becoming increasingly difficult to find an appropriate marketing pigeonhole for the standard family sedan. Buyer dollars are being wooed elsewhere—and enticingly. The

handwriting, therefore, appears faintly to be on the wall despite such cars at the moment being a mainstay of the industry.

But the category is still with us and it shows signs of robust health. The line-up of standard cars for 1967 presents the biggest, most dazzling in auto history.

**AMBASSADOR:** Leading the ’67 American Motors line is the biggest, most luxurious Ambassador ever. Wheelbase is up to 118 inches, placing the series on a par with the big Fords, Chevrolets and Plymouths. In fact, the Ambassador has grown all down the line—longer overall, wider, more trunk space, improved legroom. The car is attractively, if prosaically, styled and is well put together. Performance has been upped via the new 290-cu.-in. 2-bbl. and 343-cu.-in. 2 and 4-bbl. engines. Handling is like the car itself—modest and sensible.

*(Please turn to page 116)*



up as thinking man's transportation. The engine options give you plenty of leeway to find a balance between accumulating a fortune in gas savings or flying by the seat of your pants on an empty wallet. The six-cylinder models offer excellent American-standard gasoline economy and the "people packages," as the designers refer the passenger compartments, are solid six-seaters when you've got bench seats fore and aft.

**CHEVY II, CORVAIR:** **the 67's**  
Looking for a Chevy compact? You don't have to look far with two model lines in the compact class. In the bigger Chevy II line fall the 100, Nova, and Nova SS; in the Corvair line, the 500 and the Monza. The Corsa is gone, and perhaps next year, depending on the success of the Camaro, we might see the end of the entire Corvair line. As a result, the  
*(Please turn to page 258)*

THE COMPACTS—HOW THEY COMPARE					
Car	Wheel-base (in.)	Track (f/r, in.)	Overall Length (in.)	Overall Width (in.)	Engines in Model(s) Series* (Displacement, cu.-in.—V8 except as noted—carburetion)
Chevrolet (Corvair: 500, Monza)	108.0	55.0/56.6	183.3	69.7	164-6-Dual 1bbl., 164-6-Dual 1bbl. HiPfi.
(Chevy II: 100, Nova, Nova SS)	110.0	56.8/56.3	183.0	71.3	153-4-1bbl., 194-6-1bbl., 250-6-1bbl., 383-2bbl., 327-4bbl.
Dodge (Dart)	111.0	57.4/55.6	195.4	69.7	170-6-1bbl., 225-6-1bbl., 273-2&4bbl.
Ford (Falcon, Futura)	111.0	58.2/57.9	184.3	73.2 (4-dr.-73.5)	170-6-1bbl., 200-6-1bbl., 240-6-1bbl., 289-2&4bbl.
Plymouth (Valiant)	108.0	57.4/55.6	188.4	71.1	170-6-1bbl., 225-6-1bbl., 273-2&4bbl.

*\*Not all engines available in all models.*

**NEWPORT CUSTOM** in two-door and four-door hardtop and in four-door sedan is new series in Chrysler line for '67. It is identifiable by special paint inserts on body



**LE SABRE** by Buick highlights new front-to-rear body line. New roof styling lends coupe appearance to four-door sedan hardtop. Buick calls car big car series value leader







**DELMONT 88** joins the Olds line for 1967, replacing the Dynamic series. Car is available as a hardtop sedan and coupe, a "pillar" sedan and a convertible



**FURY III** two-door hardtop is but one of 25 models offered in this year's Plymouth Fury line. Engines range from 225-cu.-in. Six to furious 440-cu.-in. V8



**AMBASSADOR** is bigger, more luxurious for 1967. Wheelbase is upped to 118 inches, overall length to 202.5





**FORD CUSTOM 500** is available only as two-door and four-door sedan. All models in Ford line this year feature new interiors, instrument panels and trim



**IMPALA SUPER SPORT** two-door coupe features a new roof line, identifying decorative ornamentation. Car, also available as a convertible, is a high performer

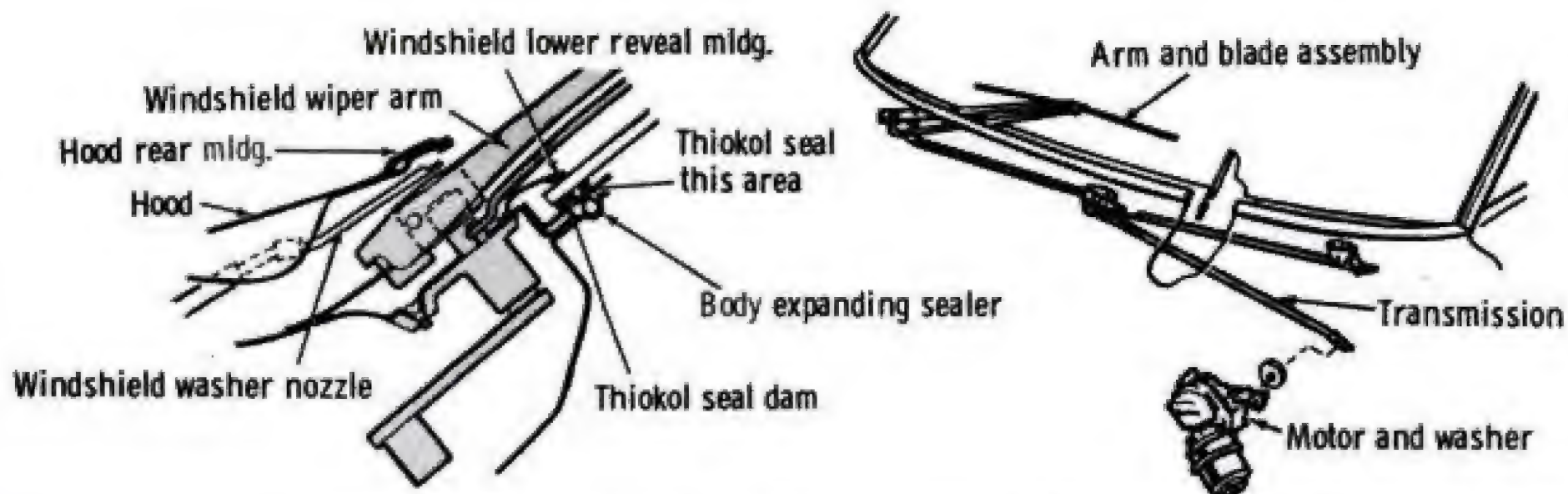


**CATALINA** is offered in two-and four-door sedans and hardtops, a convertible, two- and three-seat wagons



**MONACO** tops Dodge line, is six inches longer overall, features new hardtop roof, grille, recessed taillights





**PONTIAC** windshield wiper mechanism is tucked beneath trailing edge of hood. More powerful wiper motor is said to be capable of clearing well of ice, snow, leaves, and similar debris. Installed on all models . . .



**MARQUIS**, a new luxury two-door hardtop by Mercury, features standard vinyl roof, plush interior and split front bench seat. Car shows Lincoln styling influences, has same type of "comfort and convenience" options

## Family cars

**BUICK:** LeSabre, by reason of its 123-inch wheelbase, qualifies in this group. This year's car is not too different from the '66 model—there's a new body sweep line, a couple of barely discernible new roof profiles, and a handful of new interior styling touches. Power remains as is, the 220-hp engine being standard in a 2-bbl. version, optional in a 4-bbl.

**CHEVROLET:** No real big news here, the line remains essentially unchanged for '67. There are some minor changes in all sheet-metal treatment and in the lower body panels, presumably (I guess, anyway) the idea being to give the car a more commanding appearance. The bottom of the line Biscayne is strictly a bread 'n' butter proposition while the prima donna Caprice is a plush car in any league. The Impala SS with the 427-cu.-in. 4-bbl. is an eye-popping performer. Chevy says suspension and steering linkage refine-

ments, along with better body-frame isolation, combine to produce a smoother, quieter and more comfortable ride throughout the line.

**CHRYSLER:** Stylists have been busy here, the entire line offering new (well, *different*, anyway) bends and folds in the exterior sheet metal. Yet the general impression is that they're still Chryslers and still not too different from last year. New to the line is the Newport Custom series, designed to "broaden Chrysler's coverage of the medium price market." Other series in the line include the Newport, 300, New Yorker and Town & Country wagons. (Actually, in appointments and price the New Yorker probably belongs in the luxury category; it's here because of its 124-inch wheelbase). New this year is a 440-cu.-in. engine, either optional or standard throughout the line. Otherwise, there are no surprises, just pleasantries.

**DODGE:** The Polara, Monaco and





... Catalina, Executive, Bonneville and Grand Prix, recessed wipers give cars custom look, reduce glare



AMBASSADOR convertible top stows well aft of rear seat, offers more room, improved passenger comfort

"prestige" Monaco 500 are **the 67's** six inches longer overall than they were last year. Also, they offer a new roof in hardtop versions and are said to be "completely new" beneath the beltline. I couldn't tell; to me they look the same as the '66s. What I could spot are slightly altered grilles and new recessed taillights. The general effect is pleasing, if somewhat boxy. Dodge has a new engine for its big cars in '67—also available elsewhere within the Chrysler family—the 440-cu.-in., 350-hp (or 375-hp in a high performance version) "Magnum" V8. The usual safety "package" prevails. Again, however, there are no real surprises.

**FORD:** This is Ford's Ford line (confuses me, too), starting at the bottom with the Custom and going on up to the luxurious LTD. In between are the Custom 500, the Galaxie 500 and 500/XL. And there are no great changes in the entire line for '67. Body lines have been altered somewhat and softened, giving cars a more sculptured appearance. Series ornamentation has been changed considerably and there are new roof profiles for the hardtops. New this year on all Ford series models is a speed-control device designed into the turn-signal lever. A knob at the end of the lever turns the device on, a pushbutton sets it. Should a driver brake

*(Please turn to page 234)*

#### FAMILY CARS—HOW THEY COMPARE

Car	Wheel base (in.)	Track (f/r, in.)	Overall Length (in.)	Overall Width (in.)	Engines in Model(s) Series* (Displacement, cu.-in.—V8 except as noted —carburetion)
American Motors (Ambassador)	118	58.58/58.5	202.5	78.36	232-6-1&2bbl., 290-2bbl., 343-2&4bbl.
Buick (LeSabre)	123	63.0/63.0	217.5	80.0	340-2&4bbl.
Chevrolet (Biscayne, Bel Air, Impala, Caprice)	119	62.5/62.4	213.2	79.9	250-6-1bbl., 283-2bbl., 327-4bbl., 396-4bbl., 427-4bbl.
Chrysler (Newport, Custom, 300, New Yorker)	124	62.0/60.7	219.3 (223.4—"300")	78.7	383-2&4bbl., 440-4bbl. (plus HiPf option)
Dodge (Polara, Monaco)	122	62.0/60.7	219.6	80.0	318-2bbl., 383-2&4bbl., 440-4bbl., 440 Mag.-4bbl.
Ford (Custom, 500, Galaxie, LTD)	119	62.0/62.0	213.0	79.0	240-6-1bbl., 289-2bbl., 390-2bbl., 428-4bbl., 427-4bbl. (also dual carbs.)
Mercury (Monterey, Montclair, Park Lane, Brougham, Marquis, S-55)	123	62.0/62.0	218.5	77.9 78.2 (4-door)	390-2bbl., 410-4bbl., 428-4bbl.
Oldsmobile (Delmont 88, Delta 88, Custom)	123	62.5/63.0	217.0	80.0	330-2bbl., 425-2bbl.
Pontiac (Catalina, Grand Prix)	121	63.0/64.0	215.6	79.7	400-2&4bbl., 428-4bbl.
(Bonneville, Executive)	124		222.6	79.4	
Plymouth (Fury I, II, III, Sport, VIP)	119	62.0/60.7	213.1	77.7	225-6-2bbl., 318-2bbl., 383-2&4 bbl., 440-4bbl. (also w/special cam)

\*Not all engines available in all models



# The just-right intermediates

In great shape and rarin' to go are these middleweight contenders for the sporting image crown



**G.S.400** (for Gran Sport), new to Buick line this year, is a performance version of the Skylark. Buick says open wheels are in the grand-touring tradition



**REBEL** by Rambler replaces Classic series, features longer wheelbase, larger interiors. Top-of-line cars are designated "SST," but term is of no significance



**CYCLONE GT** is a Comet option marked by fake scoops on a fiberglass hood and lower body racing stripe



**FAIRLANE** in '67 offers a maze of options, 13 of what Ford calls "youth-oriented, high-styled models"



**SATELLITE**, along with new GTX, represents Plymouth's effort in all-out performance market. Car is available with tamed version of Chrysler Corp.'s hot racing mill—a so-called "Street" Hemi



**GTO** grille may bring to mind egg crates, but even standard 335-hp engine definitely isn't for chickens. GTO is at top of Tempest line, yet isn't offered with Pontiac's OHC-Six engine



**4-4-2** is Oldsmobile's entry in the industry's alphabet/numbers performance game, tops the F-85 Cutlass series

OCTOBER 1966





**MARLIN** sliced away some of its former bulk aft, altered the backlight lines in an effort to give the car some added distinction and dash



**CORONET 500** calls attention to its optional Hemi powerplant by adding "426" emblem in back of front wheelwell. Thus powered, car really moves



## Intermediates

PIGEONHOLED into the intermediate coop by virtue of their 116-inch average wheelbases are a flock of in-between-size cars for '67. All the old standbys are here, but on top of them is that alphabet soup of new series and/or designations. Nothing *that* new, mind you; just variations on a scheme by Detroit to inspire the Dan Gurney in all of us. This year there'll be the R/T, the SST, the GTX, and the G.S. 440 among the new numbers on the floor. Here's how they stack up.

**AMERICAN'S REBEL, MARLIN:** The Rambler Rebel, gaining two inches in wheelbase and length, should also gain a lot of attention with its new look. The top of the line SST, pictured on our previous spread, has the look of a winner. An extremely handsome front end and grille really functions to pull cooling air around the engine, unlike the "air scoops" forward of the rear wheel, which not only don't function, but mar the appearance of an otherwise "honest" automobile.

When ordering any V8 (200 to 280 hp) with the Rebel, the front suspension sway-bar becomes standard equipment. In the rear, Rebel (as well as Ambassa-

dor and Marlin) has a new four-link, trailing-arm-type suspension that'll better isolate rear-wheel rough going from the rest of the car.

The Marlin is still with us and bigger, almost big enough to qualify as a "family" car. It's been improved somewhat in styling and boasts better handling and zip. Still, one wonders why AMC is still trying with this car.

**BUICK:** The bottom of the Buick line starts right up in the intermediate field with its first three series—Special, Skylark, and G.S.400. Probably feeling that the "Skylark" tag might be too much for the birds, Buick folks "officially divorced" what is now the G.S.400 from the Skylark series. They're probably right—a ruddy young male would much prefer a masculine G.S.400 to a fine-feathered bird. And masculine it is. On the outside it's marked with such hardware as hood scoops and open wheels. Wide-oval red stripe tires (available on the Riviera) are also for the red-blooded. Otherwise, there's not much to distinguish the G.S. from the Skylark from the Special. The G.S. even shares with the Special the same plastic and die-cast grille. Under the hood, however, the story's different. The G.S. has its own en-

*(Please turn to page 222)*





**CHEVELLE SUPER SPORT 396** is available as a two-door hardtop coupe and convertible. Car's standard engine delivers brisk 325 hp while optional high-performance version cranks out 350. Car weighs 3600 pounds

THE INTERMEDIATES—HOW THEY COMPARE					
Car	Wheel- base (in.)	Track (f/r, in.)	Overall Length (in.)	Overall Width (in.)	Engines in Model(s) Series* (Displacement, cu.-in.—V8 except as noted—carburetion)
American Motors (Rebel 6 cyl: 8 cyl: (Marlin—6 & 8 cyl.)	114	58.2/58.5	197.0	78.36	232-6-1&2bbl., 290-2bbl., 343-2&4bbl.
	118	58.58/58.5	201.45		
Buick (Special, Special Deluxe, Skylark, G.S.400)	115	58.0/59.0	205.0	75.4	225-V6-2bbl., 300-2bbl., 340-2&4bbl., 400-4bbl.
Chevrolet (Chevelle Series: 300, 300 Deluxe, Malibu, SS396, Concours)	115	58.0/58.0	197.0	75.0	230-6-1bbl., 250-6-1bbl., 283-2bbl., 427- 4bbl., 327-4bbl. HiPf., 396-4bbl., 396-4bbl. HiPf.
Dodge (Coronet Series, Charger)	117	59.5/58.5	203.0	75.3	225-6-1bbl., 273-2bbl., 318-2bbl., 383-2&4- bbl., 426 (Hemi)-2&4bbl., 440 Magnum-4-bbl.
Ford (Fairlane)	116	58.5/58.2	197.0 (4-dr.-74.7)	74.0	200-6-1bbl., 289-2bbl., 390-2&4bbl.
Mercury (Comet 202 Series) (Capri, Caliente, Cyclone, Cyclone GT)	116	58.5/58.2	196.4	73.8	200-6-1bbl., 289-2bbl., 390-2bbl. 200-6-1bbl., 289-2bbl., 390-2&4bbl., 427- 4bbl. & dual 4bbl. (Limited Production Options)
	116	58.5/58.2	203.5	73.8	
Oldsmobile (F-85, Cutlass, Cutlass Supreme, 4-4-2)	115	58.0/59.0	204.2	76.0	250-6-1bbl. 330-2bbl., 400-4bbl.
Plymouth (Belvedere Series, Satellite)	116	59.5/58.5	200.5	76.4	225-6-1bbl., 273-2&4bbl., 318-2bbl., 383- 2&4bbl. 426(Hemi)-2&4bbl., 440-4bbl.
Pontiac (Tempest, Tempest Custom, Tempest Safari, LeMans, GTO)	115	58.0/59.0	206.6 (Le Mans, GTO)	74.4 74.9	230-OHC6-1bbl., 230-OHC6-4bbl., 326-2&4- bbl. Std. & opt. in GTO only: 400-2&4bbl., 400-4bbl. HiPf.
					*Not all engines available in all models.



# Those live-it-up luxury jobs



**TORONADO** headlight covers are flush with hood this year. Olds claims car has a smoother, quieter ride



**THUNDERBIRD** features new styling all around. Headlamps retract. Car is also offered in four-door version



**IMPERIAL** stresses rather angular lines, brisk trim. Car is nearly 19 feet long, weighs over 5000 pounds



# loads of fun for \$2500 a ton



**OLDS 98** has new front-end styling treatment, some modification aft. Interiors are elegant, functional



**RIVIERA**, if you look real close, has a slightly modified grille. Power for '67 has been upped by 20 hp



**CONTINENTAL** has a new grille, relocated signature plate. But overall, car remains basically the same  
**OCTOBER 1966**





**IMPERIAL** offers "mobile director" option in Crown Coupe. Front passenger seat can be turned around, the arm rest reversed and unfolded to form a table



**TORONADO** doors—big and heavy—open much easier in new models. Required effort is cut in half thanks to new standard spring-operated assistors



**CONTINENTAL** claims spring-loaded hood ornament is a safety feature. Gimmick is really an attempt to thwart theft of star



**THUNDERBIRD** four-door proves necessity is often the mother of invention. To realize the design concept, portions of roof had to be attached to rear doors. Result appears jerry-built

**N**EW IN THE HIGH-DOLLAR MARKET for 1967 are a four-door Thunderbird and Cadillac's front-drive Eldorado.

Competing entries in the prestige field are more-or-less holdovers from last year, with styling face-lifts here and there and a smattering of engineering, performance and comfort and convenience refinements and options.

All cars in this category are expensive and—with the exception of the gung ho Corvette's 98-inch wheelbase—all are big, powerful and opulent. Test-driving them, one tends to wonder just how far Detroit stylists and engineers can go before these automotive dreamboats become out-and-out equivalents of Cleopatra's barge.

#### ● Cadillac

Highlight of the luxury car field this

year is the new front-drive Eldorado. Unfortunately, as this issue of PM locks up, we have no official information about the car (or any of the 1967 Cadillacs, for that matter) and queries to the factory assured us no cars would be available for photography in time to make our deadline. But during visits to the GM Proving Grounds at Milford, Mich., we saw a number of Eldorados and got the impression that it's a somewhat angular, square-ish version of the Riviera/Toronado body, only bigger and definitely a Caddy, particularly up front.

#### ● Thunderbird

The new "four-door Landau" has all the earmarks of having been designed by committee. Overall, it's a sleek package affording what Ford calls a "low GT look."



But when you take a close look—feature-by-feature—you get the idea every Tom, Dick and Harry has had a hand in it and that they've all pretty much had their own way.

For example, the four-door gimmick is achieved through an awkward, compromise arrangement of rear doors and roof; closed, everything looks tidy, but opened, the effect breaks down. The doors appear to have parts of the roof "nailed" on them. It's a jury rig and looks it (see photo).

Inside, all the new T-Birds are plush beyond a chorus girl's wildest dreams. The carpeting is thick and elegant, the upholstery and seats soft and cuddly. The dash is new, Ford having scrapped the four-in-a-row "golfball" instrument cluster. Gadgets galore rule the roost.

Offered are a two-door hardtop and landau and the four-door. There's no convertible at the moment. A zoomy four-bbl., 428-cu.-in. V8 is optional throughout. Braking and steering, however, despite standard front wheel discs, remain uniquely T-Bird adventures, at times rather wild.

#### ● Imperial

Being introduced this year under the Imperial imprint is what Chrysler Corp. calls "a new generation of cars." Styling changes are extensive, though minor. To the average eye the car doesn't look *that* changed. Power has been stepped up and the option list lengthened and made more exotic, including a vest-pocket "office" arrangement for the Crown Coupe in which the front passenger seat can be reversed and the arm rest folded out to form a small desk table (see photo).

#### ● Oldsmobile

Toronado is relatively unchanged. The grille has been altered and the headlight covers are flush with the hood. The 98 drops five inches aft, adds five up front, the result being a Toronado-ish profile. The grille and hood lines are new and some metal has been bent in different directions here and there. It's a nice, luxurious "Mother and Dad" car, period.

#### ● Buick

Riviera has a different grille and its power has been upped 20 hp. Otherwise, don't look for big changes, the design philosophy apparently being "Why mess with a good thing?". Both Electra and Wildcat have new grilles and feature rear end styling changes. The Wildcat is kind of racy looking, the Electra, substantial. All top-of-the-line Buicks this year feature bigger, more powerful engines.

#### ● Corvette

New front fenders, a new hand brake setup, but that's about it. A triple, two-bbl. carbureted version of the muscular 427-cu.-in. 425-hp engine is available as a new power option.

#### ● Lincoln Continental

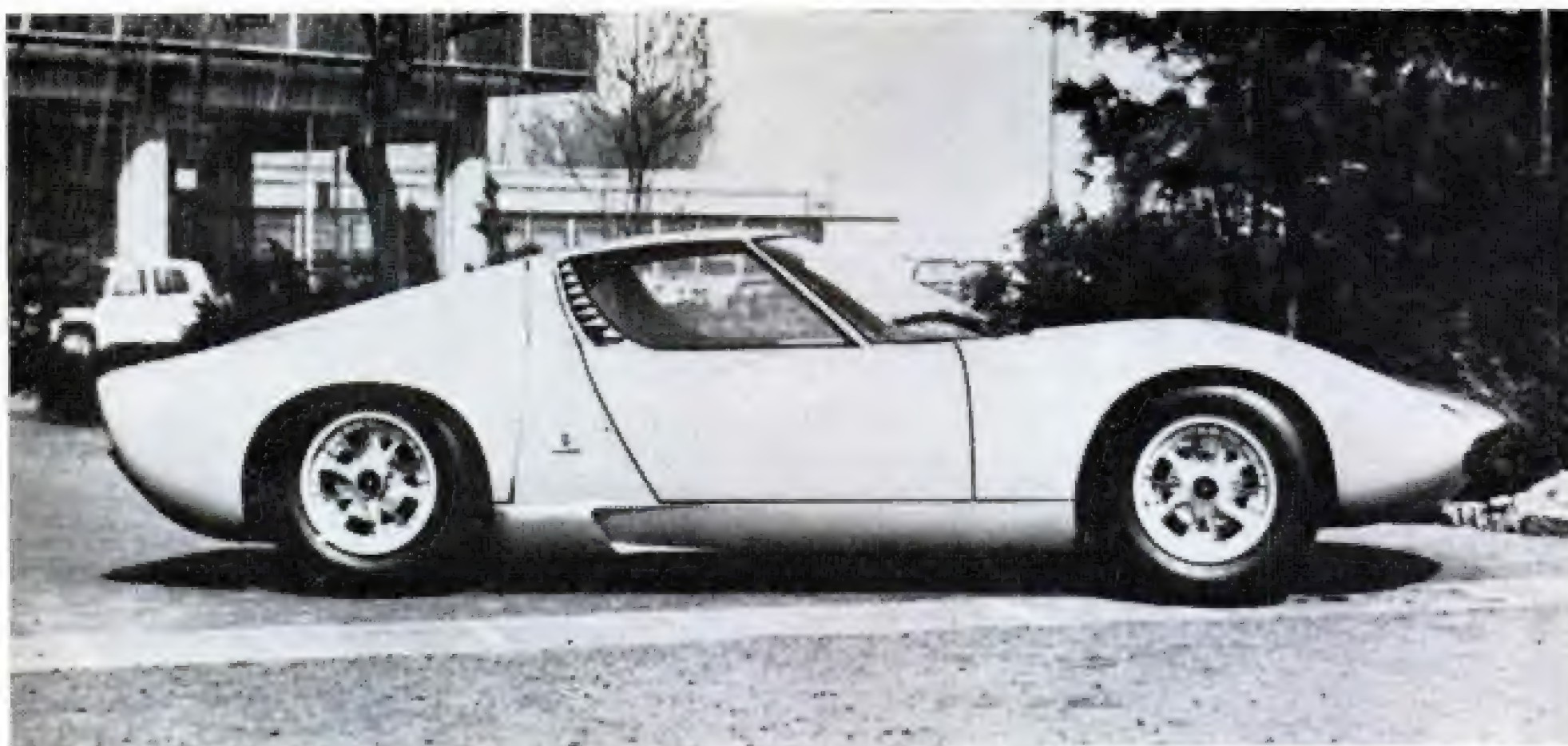
There's a new grille this year and a new interior ventilation system. The rest of the car remains pretty much as is, with only minor styling touches and refinements. Power is still the massive 462-cu.-in. V8, largest engine in the industry.

In general, the cars in the luxury class are what they set out to be—quiet, comfy and reassuring.—Bill Kilpatrick

LUXURY CARS . . . HOW THEY COMPARE

Car	Wheelbase (in.)	Track (f/r, in.)	Overall Length (in.)	Overall Width (in.)	Engines in Model Series (displacement, cu. in.—all V8s, 4 bbl. carburetion)
Buick (Electra)	126.0	63.4/63.0	223.9	80.0	430
(Wildcat)	126.0	63.4/63.0	220.5	80.0	430
Cadillac	not available				462
Continental	126.0	62.1/61.0	220.9	79.7	327, 327 HiPf., 427, 427-Triple 2 bbl., 427-Triple 2 bbl. HiPf.
Corvette	98.0	57.6/58.3	175.1	69.6	440
Imperial	127.0	62.4/61.1	224.7	79.6	425
Olds 98	126.0	62.5/63.0	223.0	80.0	430
Riviera	119.0	63.5/63.0	211.3	79.4	390, 428
Thunderbird (2-door)	115.0	62.0/62.0	206.9	77.2	390, 428
(4-door)	117.0	62.0/62.0	209.4	77.2	425
Toronado	119.0	63.5/63.0	211.0	78.5	





**Sideways-mounted, 12-cylinder engine** is major feature of new Italian Lamborghini P400 GT Miura, which comes in two models, one for the road and one for the track. The transverse engine is set toward the rear but near the center of the chassis for better balance. The "cockpit" is insulated from heat and noise. Production begins this fall. Price: about \$18,000.



**Engine warmups** can be speeded with the Throttle-Set, a new accessory which presses down on accelerator pedal and adjusts to any idling speed. It is also useful for battery charging, radiator flushing or windshield defrosting.

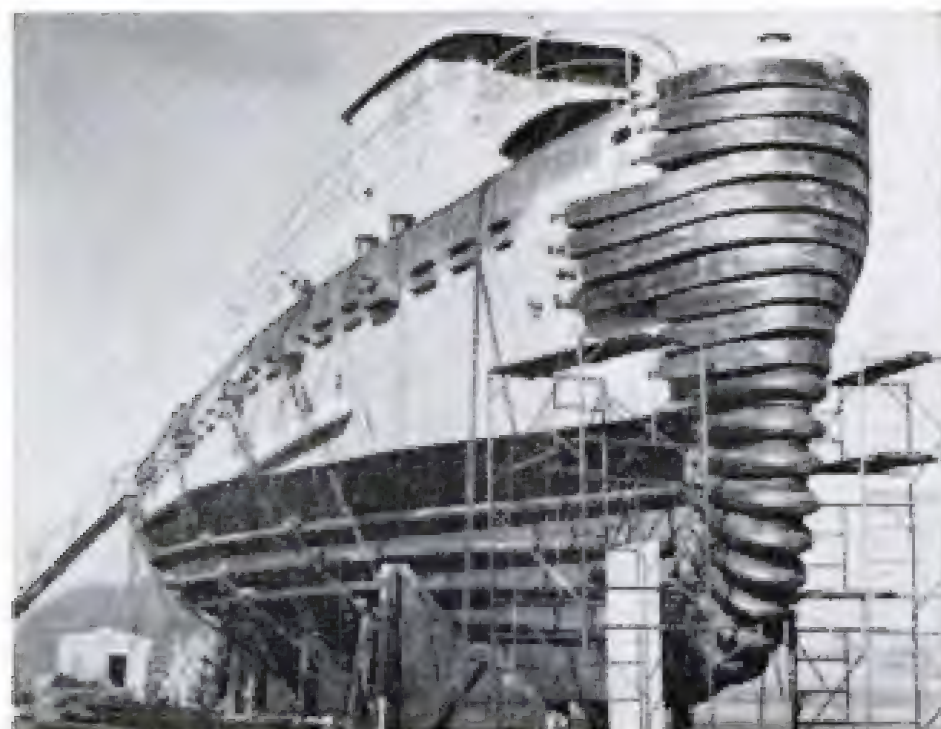


**Hundreds of water jets** spray the flight deck of the British aircraft carrier HMS Hermes as she travels through a sparkling sea. The object of the wetting is to remove "nuclear fallout" pollution and was all part of a nuclear warfare exercise.





**Electric motorcycle** operates without clutch or gears and has a top speed of 25 mph. Powered by two six-volt batteries that must be recharged every 12 miles, the English-made bike is only 24 inches high and weighs 120 pounds. Except for handlebars and fork it is made of fiberglass.



**Tender fenders** for atomic subs are attached to the hull of a tugboat that will handle the undersea craft. Each foot of the 14 tons of specially developed rubber sheathing will absorb 32,000 pounds of energy, insuring gentle docking for the low-lying new subs.



**Adjustable walking stick** designed by a British doctor has a funnel-shaped base and a wide rubber shoe to give greater security to the elderly and infirm.



**Dummy that talks** like an astronaut has been developed by CBS Laboratories. It represents every contour of an average astronaut's head (including brain) to within one-tenth of an inch, and will be used to test and evaluate space helmets, earphones and microphones.



# ***World's dirtiest drag race***

***By KEN WARNER***



**CONVENTIONAL BUGGIES** churn through the mud that has been carefully prepared to make going difficult



**UPSWEPT PROW** on this special racing model allows the buggy to hit the potholes and slide on through



## The dirt flies when these wild-riding mechanical monsters battle to win in Florida's Mile of Mud

**S**NARLING AND WHINING they come charging through the mud, diving into potholes like hippos run amok. Leaping, skidding, charging, with mud-caked apparitions at their controls, the swamp buggies on Derby Day at Naples, Fla., look like a junk dealer's nightmare.

The "Indianapolis" versions of the conventional Everglades swamp buggies—souped-up mechanical monsters—have been racing at Naples since 1949. The town fathers have provided a special track called the Mile of Mud and they carefully mess it up twice a year. The races come off in February and October, and if there aren't 8000 spectators on hand, something's wrong.

Swamp buggies—old-timers call them mud-buggies—have snorted around the swampy Everglades since Ed Frank of Naples discovered in the '20s he could put truck tire casings around the tires on a Model T Ford, carry plenty of spare parts, and ramble long distances through the waterlogged wilderness of Collier County, where the Everglades become the Big Cypress Swamp. He soon had company, but it was World War II that brought swamp-bugging to everyone—the heavy-duty chassis and four-wheel-drive systems that became surplus after the war were ideal.

Sooner or later, men who build traveling machines race them. The spectacle is not a searing test of speed. It's more a slogging match. Over parts of the course, men on foot can outpace the machines, but they become mighty slimy men on foot. So do the machines, for that matter—sometimes a

**DUAL-TIRED REAR WHEELS** and heavy-duty chains aid this Jeep in getting through the mud. These conventional vehicles usually compete in their own special class







**RESEMBLING A MARTIAN HAY WAGON**, the Jack Hatcher Special has been a top Derby competitor



**CHAINS ARE LIMITED** to seven-inch links of half-inch stock, and many are welded from reinforcing rod



**HUGE REAR WHEELS** with tractor tires take the full load on this racing model, and the smaller front wheels barely touch the ground when it is under way. Without a seat belt the driver would be thrown at full tilt

machine that drowns out early in the race wins because everyone else in the race drowns out twice!

In the 17 years of competition, a fair-to-all system of classes has worked out. There are seven classes, from one-or-two-cylinder air-cooled putt-putts to eight-cylinder four-wheel-drive giants, plus a special class for Jeeps, Scouts and Broncos. There are heats for each class, and heat winners meet for the Swamp Buggy Classic. The winner of this race is crowned Swamp Buggy King.

Lately, the king generally drives to his throne on a two-wheel-drive V8 monster, the first of which was named the Grasshopper because that is what it looked like. For actual swamp travel, a four-wheel-drive "conventional" buggy is best, but to win overall on the Mile of Mud, something different scampers better. The type evolved calls for V8-power, and all the weight on the rear wheels while the front end cantilevers way out ahead, with only enough weight on it to give steerage to the high skinny front





**CONCENTRATED REAR WEIGHT** would turn this machine completely over on dry ground, but it literally leapfrogs through the muck and mire of a swamp. Extended front helps shield driver from flying objects



**COMPLETELY HANDMADE**, this welded frame putt-putt has air-cooled engine mounted high to keep it dry

wheels. The driver sits far forward. Such machines as Jack Hatcher's Special or Les Beasley's Half-Fast II just barely get their front wheels on the mud. Beasley says his machine would turn itself over if given power on dry ground.

Whether racing one of these rule-beaters or a genuine hunting buggy, preparation is as important as power or design. Half-Fast II has a bored-out over-400-cubes Olds V8 running a screw-type GMC rear end through what is called a "Hydra-Stick" transmission—



**TRYING FOR BETTER CONTROL**, the designer of The Munster moved the seat and controls to the rear

it's a beefed-up tightened Hydramatic—and driving tractor-tired wheels Beasley built himself. Half-Fast II was way out in front last February when a gas line broke, and Hatcher's Special came up to win the race.

A handy man can put together an air-cooled putt-putt that will go right through the same mud—somewhat slower, but it will go through—as the rule-beaters for a couple hundred dollars, depending on the engine cost. Many four-

*(Please turn to page 243)*

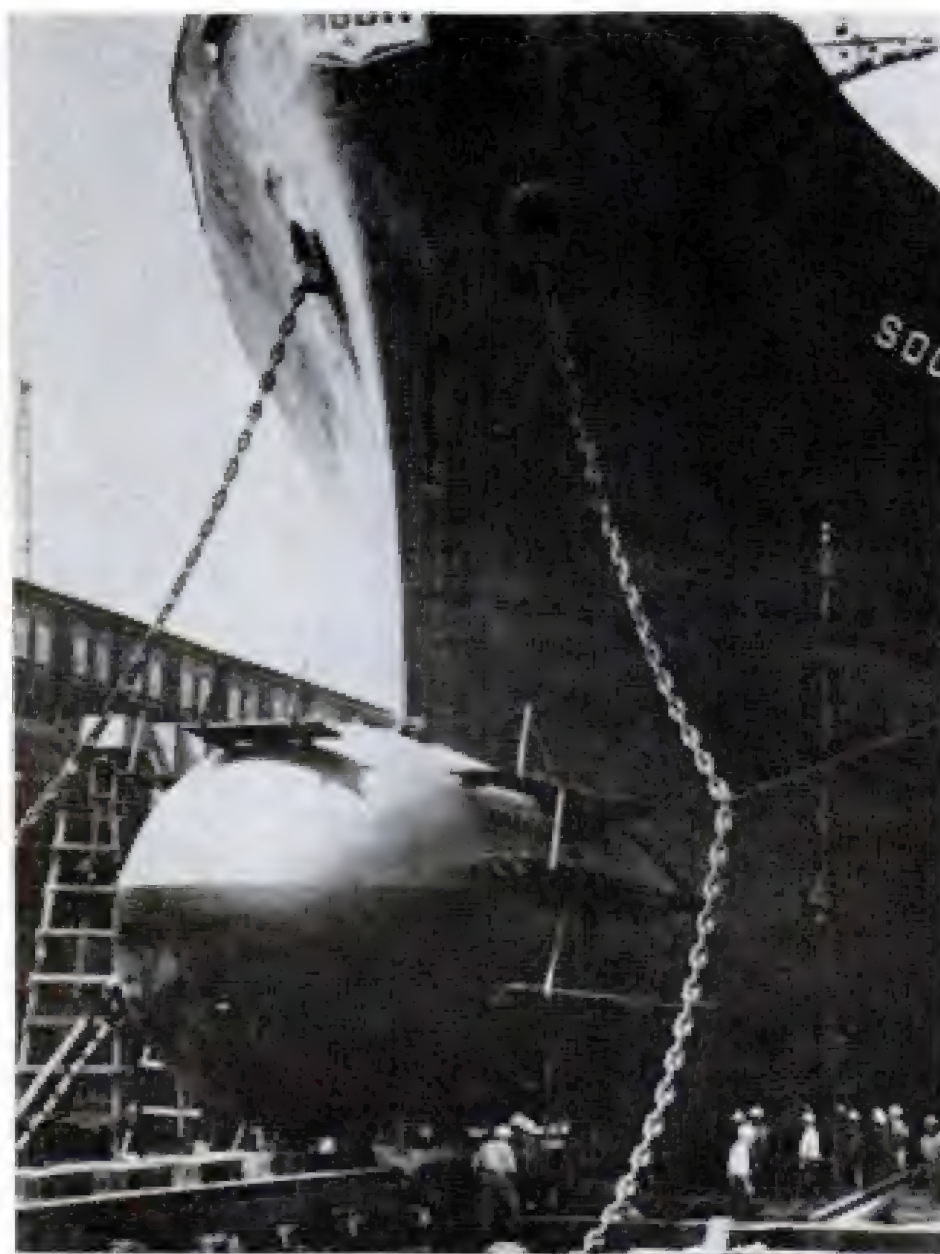




**Resembling a winged torpedo**, this nine-foot-long propulsion unit is used by Navy scientists for underwater research. The unit is equipped with a 16-mm movie camera and two 600-watt floodlights. It has airplane-type controls and a 1.5-hp battery-operated electric motor. It can travel up to six nautical miles at about 4 mph, giving a skin diver great mobility.

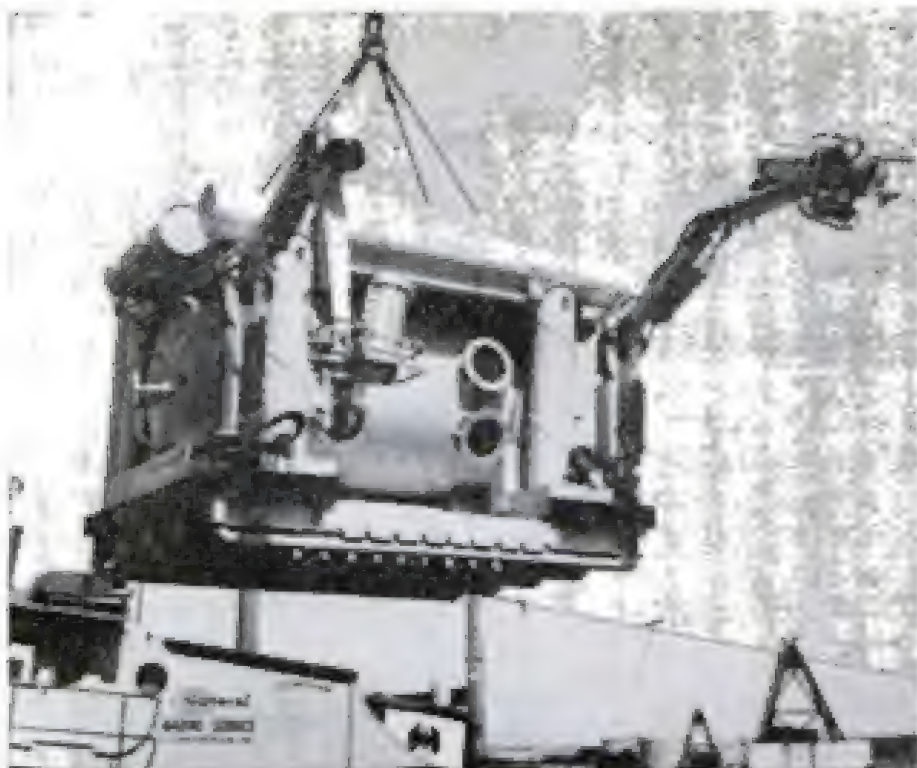


**Amplified heart sounds** thump through this battery-operated electronic stethoscope, developed by Air Force scientists for use aboard evacuation planes in Asia. Earmuff headphones shut out the noise of aircraft engines when doctors examine sick and wounded soldiers.



**Nose operation** on this oil tanker resulted in an unusual, bulbous bow. The bulb, according to engineers, will permit the tanker to operate at higher speeds without increased fuel consumption because it will smooth out waves created by the ship's movement through the water.





**Another submersible rig** joins the growing army of undersea vehicles for salvage and exploration. This one, made by General Marine Service and Transportation, Inc., has a depth range of 1500 feet. It has two mechanical arms, closed-circuit television, lights, ballast and propellers for propulsion underwater.



**Two-pound battlefield radar** mounts on grenade launchers, bazookas and machine guns to spot targets and indicate distance. It also has an FM radio for use between men using the device. Radar and radio are controlled by just three knobs.



**Planes coming in with disabled landing gear** can in five minutes be given a 3000-foot-long blanket of foam to slide on. The Navy's new runway-foaming tanker can lay down that blanket, 24 feet wide, to lessen the danger of fire. This method cuts in half the time required by the old method of spraying foam from a hand-held nozzle.



# Those built-in clocks that run your body

Every living thing—even the lowly amoeba—has time-pieces that keep it functioning. When these clocks are thrown off, look out for trouble!

By Clifford R. Hicks

**R**ECENTLY AN AMERICAN SCIENTIST, wired and instrumented like an astronaut, touched down at the airport in Manila. An accompanying medical team immediately began testing his alertness and coordination.

At the same moment, one of his colleagues was going through a similar drill in Rome. Both were groggy after landing. Instruments inserted in their bodies, as well as the mental tests they took, showed that they couldn't even add a simple column of numbers that would be a sitting duck for any third-grader.

What disoriented these high-flying Ph.Ds?

Their fast jet hops across at least five time zones had thrown their built-in clocks (which had started ticking even before they were born) far out of kilter. Inner alarms were going off at all kinds of odd hours, and continued to do so up to five days. The result was internal bedlam.

You have similar built-in biological clocks, and so does every other living thing. Research into these natural time-pieces has touched off hotter arguments among excited biologists than anything since Darwin's research suggested that man might be a distant relative of the ape.

Biologists are firmly convinced, however, that in probing biological clocks they are investigating something of such profound significance that they scarcely know which lead to follow. The implications are tremendous. For example, scientists now know that:

- Biological clocks tell the various parts of your body when to increase or decrease your heartbeat, metabolism, blood pressure, brain wave activity, urine secretion and even the rate at which your whiskers grow.
- Biological clocks that go haywire can trigger human ailments.
- The same drug or medicine can harm or help you, depending upon when it is taken in relation to your own "clock time."
- Biological clocks play a significant part in some allergies

**MOON AFFECTS METABOLIC RATES** of organisms, experiments show. "Noon" on the chart is when the moon is at highest point in sky; "midnight" is lowest point



Seaweed



Potato



Carrot



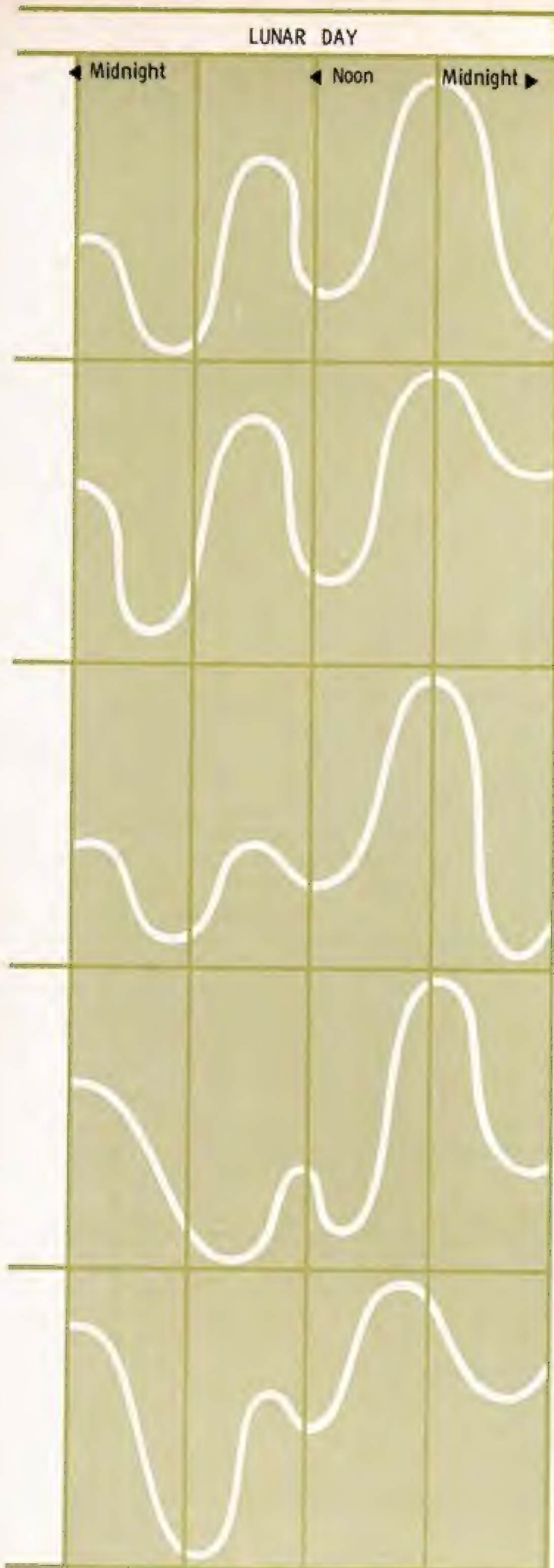
Newt



Earthworm

PM





**"OPERATION SPUDNIK"** is brainchild of biologist Frank A. Brown Jr. Orbiting a potato around sun, he says, will show if man can survive in outer space



**ACTIVITY IN TANK** is automatically recorded when fish swims across it and interrupts light beam. Activity records are then checked with phases of moon



**RATS HAVE LUNAR CYCLES TOO.** Even when sealed in boxes, they run when "moon tells them." Caged rats' activity on the teeterboard shows up on recorder





**LEAVING PEN**, snails turn right. But a magnet placed under dish would make them turn left. Prof. Brown thinks magnetic fields affect many organisms

and mental diseases.

The research also raises some formidable questions:

- A commercial jet pilot may cross four or five time zones each flight. Can his body set up defenses against the internal bedlam that results? If not, what effect does this have on his ability to pilot a huge plane?
- Should a diplomat fly halfway around the world to make an important on-the-spot decision if his thinking is foggy for days after his arrival?
- Will the internal clocks of our astronauts, automatically synchronized by the rhythms of the Earth, become so confused on long space voyages that the men will disintegrate, physically and mentally?

In trying to answer such questions, biologists have discovered that clocks are all-pervasive in the living world. Every cell of your body has a built-in clock, and even the amoeba has its own little "Timex."

"Biologists have gone even further than that," says Prof. Frank A. Brown, Jr. of Northwestern University, who has been investigating living clocks for the office of Naval Research since 1953. "Surgery has been performed on a single cell, the part containing the nucleus has been cut away, and the remaining cytoplasm continues to display a precise, clock-timed rhythm!"

Where are such clocks? How do they operate? What sets and resets them? These are some of the basic questions that have not yet been fully answered.



**FOR CAMOUFLAGE**, pigment in fiddler crabs goes from light to dark every 24 hours. Clock in lower crab has been "reset," causing the lack of color

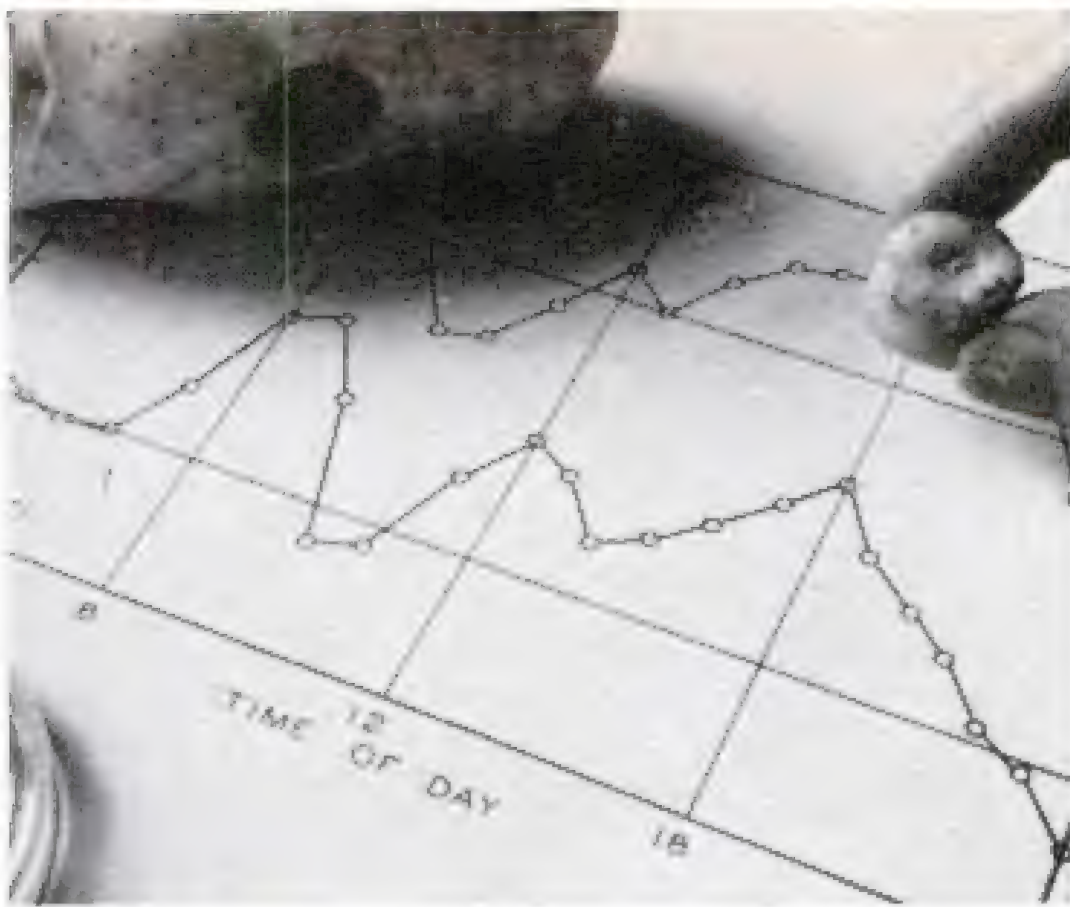
Yet, the clocks—or at least their effects—do exist, without question. Take a look at some of the evidence:

Precisely on October 23 each year, the famous swallows of Capistrano fly off to their winter resort, and each spring they return to their southern California home on March 19. What crosses out the days on their built-in calendar?

There are two obvious answers: Living organisms may be able to measure the duration of daylight and darkness; or they can obtain clues through changes in temperature. But at the University of Toronto, Dr. Kenneth C. Fisher and Dr. Eric T. Pengelley kept a ground squirrel in the laboratory at exactly 35° F. and in precise 12-hour cycles of light and darkness for more than two years. The squirrel hibernated from October to May—its normal hibernation period—each year. How did it know when to go to sleep? What touched off its internal alarm to wake it up?

Plants function similarly. Before the turn of the century, the German botanist Wilhelm Pfeffer noticed that bean seedlings perform a rhythmical sleep-waking dance, lifting their leaves by day and drooping them at night. Obviously they were responding to sunlight and warmth. But were they? Pfeffer put the bean seedlings in a sealed box, and kept the temperature and light level constant. The bean plants not only continued the dance, but precisely timed it to the ever-changing daylight-darkness cycle outside their





**IF SHOT INTO SPACE** in a satellite, potato plug like this would have its clocks so scrambled that it would die. That's Prof. Brown's current opinion

closed box. How does a bean seedling know when it is time to go to sleep or wake up?

All plants ever tested, without exception, have shown such rhythms. And most rhythms, not surprisingly, are timed to approximately a 24-hour cycle.

But here is another mystery. Rhythms now can be precisely plotted, and it turns out that virtually none of them is *exactly* a 24-hour cycle when the organism is deprived of light and temperature clues. All "daily" rhythms then run slightly longer or shorter than 24 hours, yet supposedly they are "tuned" to the revolution of the Earth. Why the discrepancy?

The "beat" of your own body under such conditions, for example, is somewhere between 25 and 25¾ hours (it varies slightly with individuals). Recently two student volunteers were placed in an isolation chamber which was kept at a constant temperature and humidity. They were told to study, exercise, eat and sleep whenever they wished. Without any clues from outside the chamber, their pattern of activity quickly settled into a day that was 25 hours and 45 minutes long.

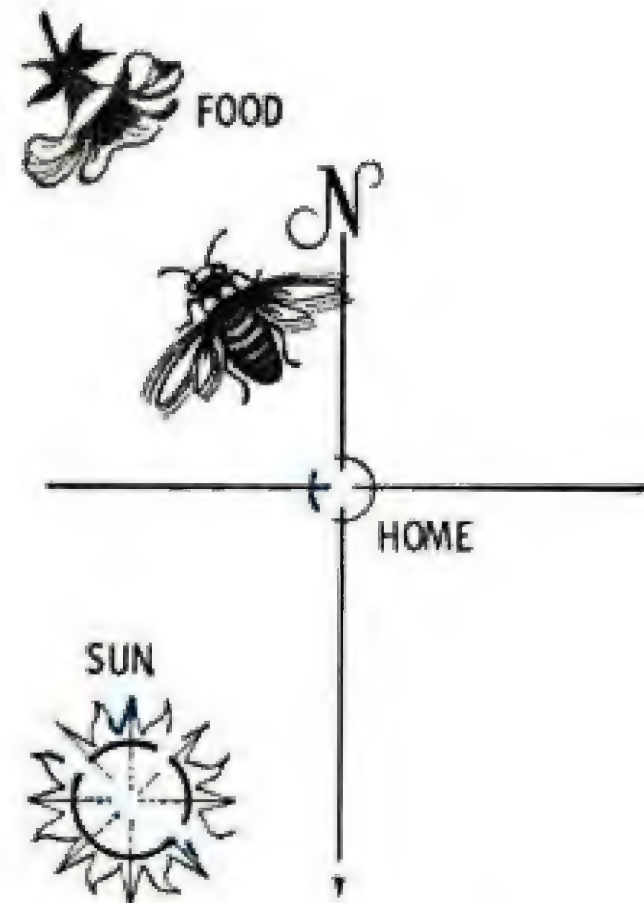
"Your daily timing system," explains Prof. Brown, "behaves as if you have a built-in tape recorder, with a loop of tape that moves at a rate of about one circuit per day. Upon this tape certain functions are impressed, which recur with daily frequency until they are erased or substituted. When you cross several time zones, these complex daily patterns soon get out

of synchronization, and it takes several days to shift them on the tape, one by one, to match the rhythm of your new environment.

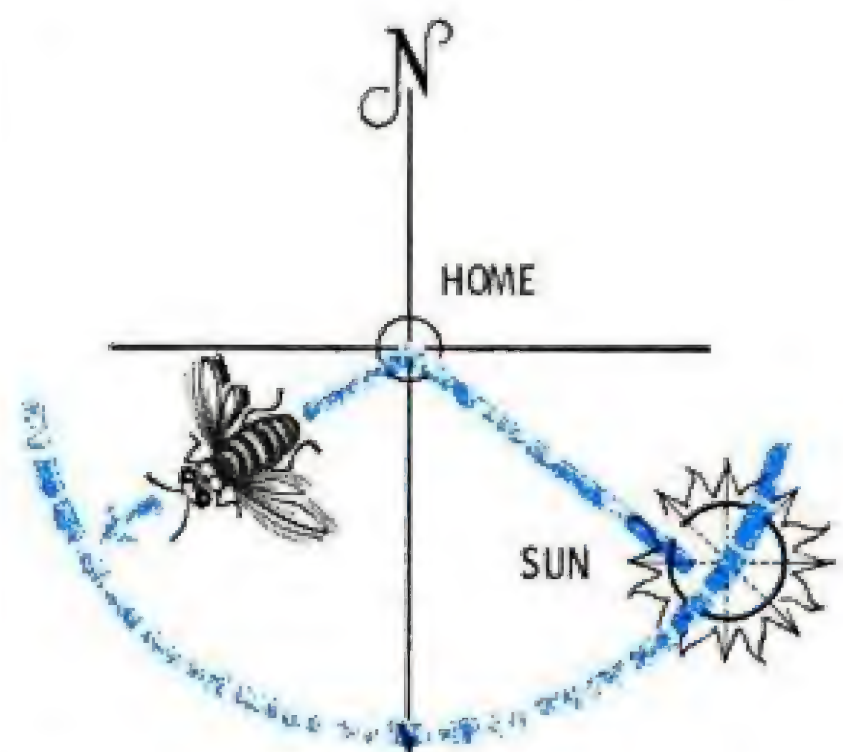
"Such patterns can be very precisely plotted, and really are highly accurate clocks. If I could study your kidney for a few days to determine its rhythm, I could use it as an ordinary clock, and tell the time within three or four minutes."

Not all biological clocks are set to daily rhythms; some measure other time intervals. For example, take a look at the grunion. On the second, third and fourth

*(Please turn to page 226)*



**TRAINED IN NEW YORK**, bees leave their hive and fly northwest to a feeding station. Flight always takes place at 1 o'clock in afternoon

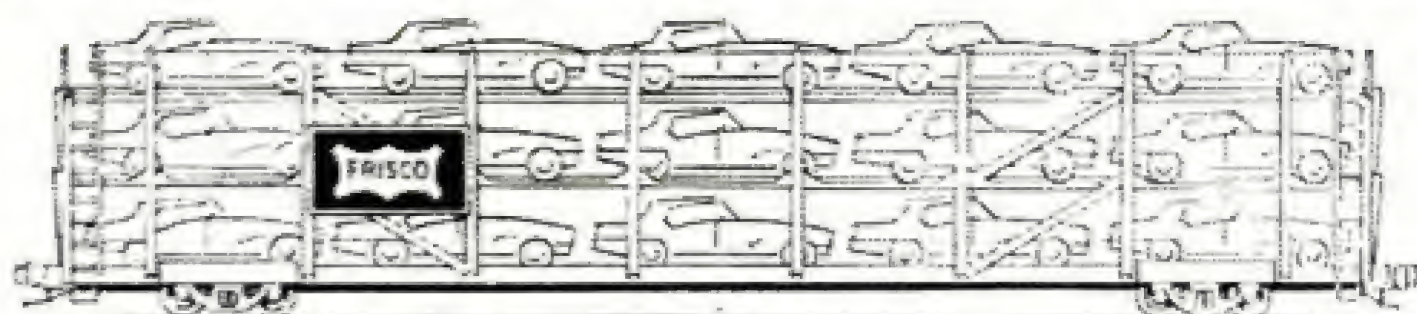
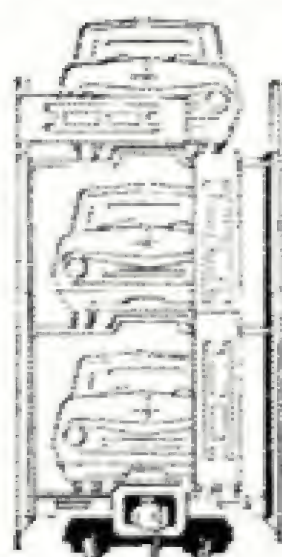


**MOVED TO CALIFORNIA**, same bees buzz off at 10:00 a.m. in search of food, maintaining same angle to sun's azimuth as in New York

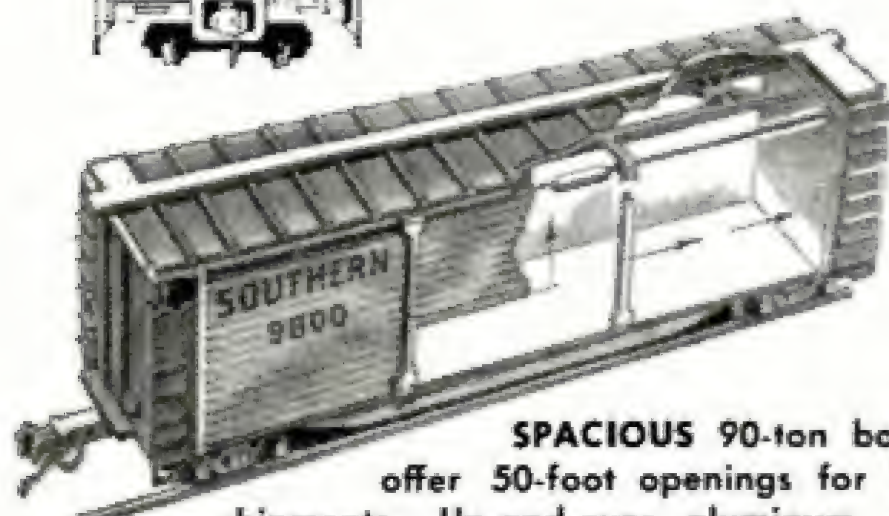


# Look what's happening

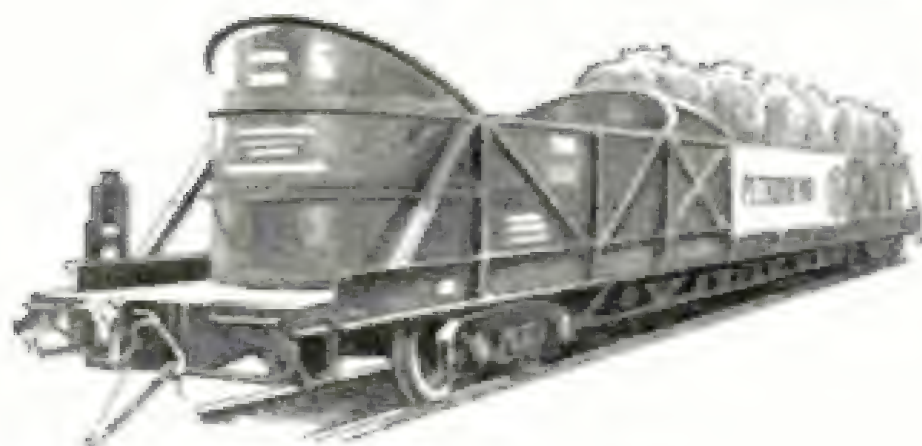
They've grown into rolling warehouses that dwarf the biggest trucks.



**AUXILIARY RACKS PERMIT MONSTER FLATCARS** to double as tri-deck auto transports. Loadings of this type have increased six-fold in past 10 years



**SPACIOUS 90-ton boxcars** offer 50-foot openings for bulky shipments. Up-and-over aluminum doors are raised and guide posts shoved aside



**CONTAINERS** that hold containers free this flatcar for conventional service. The big bins, which are removable, here accommodate sacks of polyethylene pellets



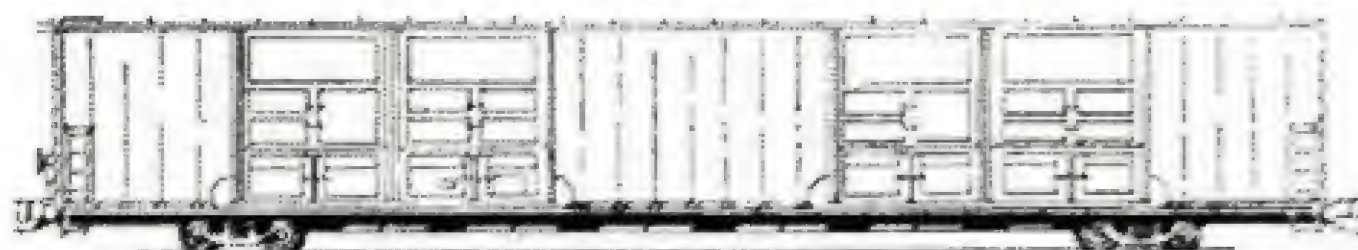
**WORLD'S LARGEST COVERED HOPPER** rates an elaborate launching ceremony. The stainless-steel brute is an elongated version of a 100-tonner now being mass-produced. Needless to say, the gals who are doing the loading aren't regular railroad workers



# to freight cars!

By HENRY B. COMSTOCK  
Drawings by the author

And the jumbo tankers, hoppers and flatcars roll at mile-a-minute speeds



"SIDE-DOOR PULLMANS" have been given a two-way stretch—to 91-foot length and 15-foot height. But platform clearances still hold width to 10 feet



All this points up the Cinderella story of the American freight car. Thirty years ago it was the drudge of the rails, forever slinking onto sidings to let the darlings of the passenger department by. But today the slipper is on the other foot. Roller-bearinged warehouses on wheels waltz over the high iron at mile-a-minute speeds, knuckled together in trains with seductive names like *Mae West* and *Sally Rand*.

This year, the railroads are shelling out close to \$1 billion for more than 53,000 of the mechanically sophisticated giants. Orders for 90,000 additional units are on the manufacturers' books, with delivery dates as distant as the summer of '68.

Big capacity is the most eye-popping feature of the super cars. Recently, a



**NO MORE BATTLING** frozen or rust-bound hopper doors. A flip of a valve and one or all three dumpers on this Santa Fe car open with an effortless hiss

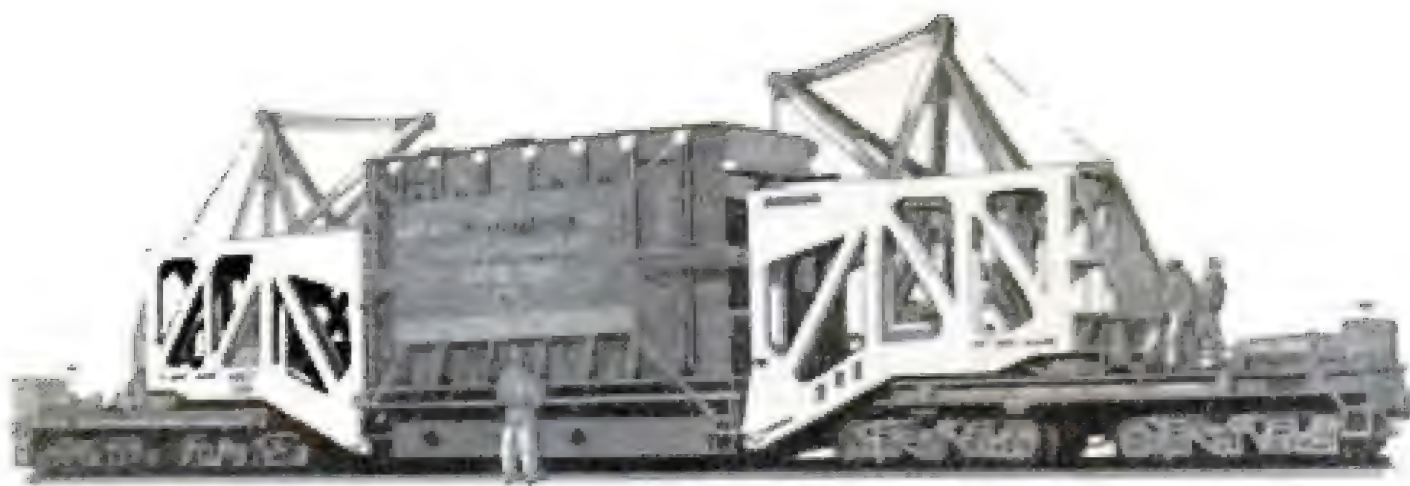
**COMPRESSOR-EQUIPPED TANK TRUCKS** (below) exchange air for dry-bulk cargo in ACF Industries covered hoppers. Each of the Flexi-Flo car's five sealed compartments holds 20 tons—or one full truckload



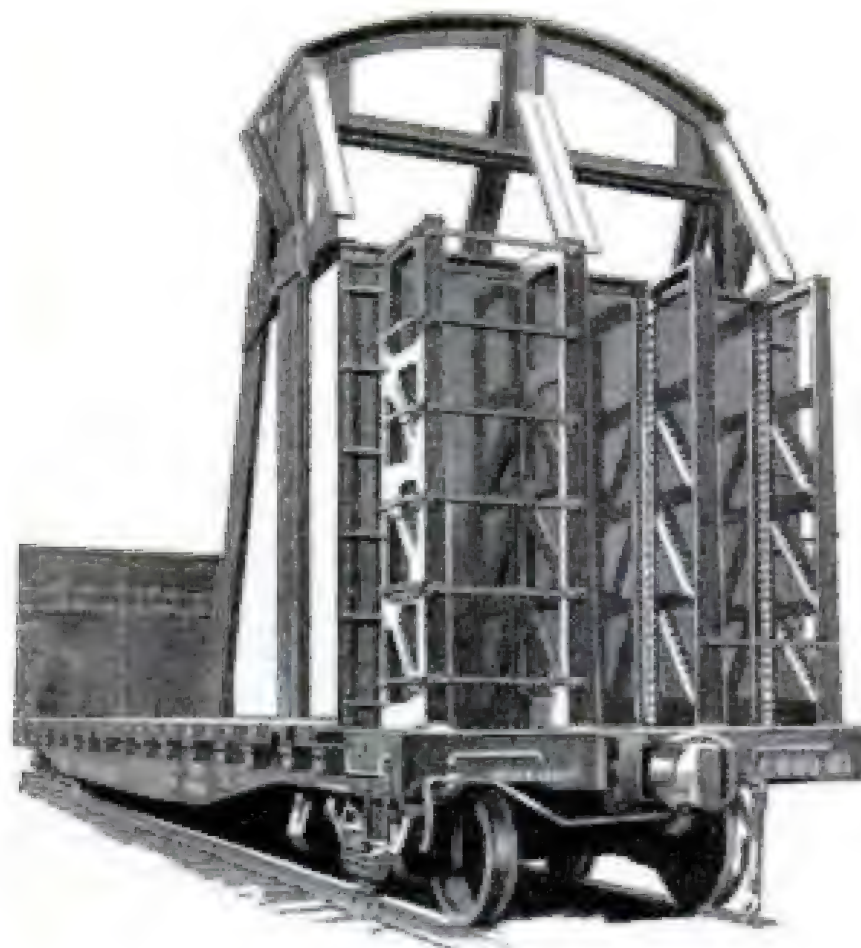
**BUILT-IN TRAVELING CRANES** make any siding a container-car terminal for Southern Pacific's home-shopped Liqui-Bin car fleet







**UNIQUE "SCHNABEL" CAR** built for Westinghouse separates at center to support the ends of 250-ton transformers. Load-bearing frames with retractable derricks are rigidly latched to the transformer. The big car is shown closed at right



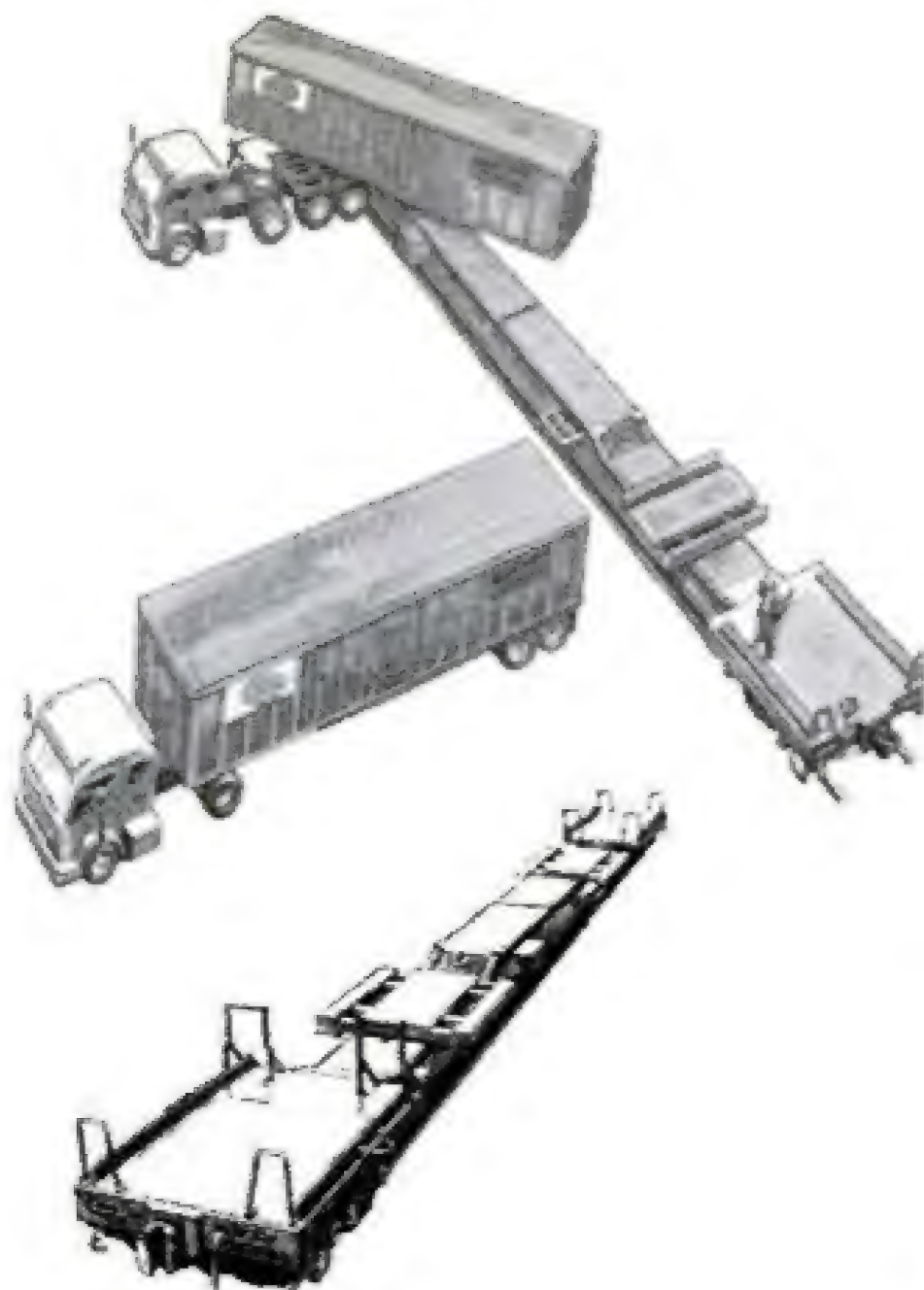
**BULKHEAD FLATCARS** normally transport pulpwood or wallboard. But some Clinchfield R.R. jobs run interference for auto transporter cars in the winter, clearing away destructive ice from roofs of tunnels

**SELDOM SEEN**, because most are outlawed on the high iron, are fleets of industrial cars. Basically, designs don't change, but capacities do. For example: single-pot slag haulers (right) are now losing out to larger multibucket jobs



**LESS-SOPHISTICATED VERSION** of ACF's Flexi-Flo hoppers is this popular 100-tonner. The big cylinder carries 4 percent more payload than straight-walled cars of equal enclosed cubage, and discharges it faster and more completely. Too, it is cheaper to build because it requires no underframe





**INTEGRAL TURNTABLES** on Flexi-Van piggyback cars eliminate awkward end loading. On the debit side, they can only handle trailers that are equipped with wheel assemblies that slide free of other frames



**TREND TO REPLACE CABOOSE CUPOLAS** with bay windows has been slowed by the introduction of overhanging "gig tops." International Car Co. model features high-back seats with safety belts, propane heating, electric lights and radiophone communication

private shipping line introduced a 16-wheeled "land tanker" which carries four times the average payload, or 50,000 gallons of liquefied petroleum gas. So artfully was the fish-bellied giant slung between four trucks that it won first place in a beauty contest sponsored by the American Iron & Steel Institute.

Soon afterward, the Norfolk & Western took a flyer into the future. Unlike most roads, the N&W builds its own rolling stock, with the accent on coal-hauling hoppers. These have steadily increased in size—from 70- to 85- to 90-ton whoppers. While the last are about as massive as they come, welders took off a couple of coffee breaks to fasten together a 150-tonner. If this gargantuan test model proves successful, semipermanently coupled sisters of the same capacity will soon be thundering from the mines to market. Very likely, the unit-trains will have swiveling connections, permitting some cars to be flipped in rotary dumpers while their neighbors remain upright.

Happily, jumbo equipment presents no production problems. That's because builders have given up treating each order as a special slide-rule chore. Instead, they design and stock a wide variety of "Erector Set" parts. Among them are standardized underframe members, single-stamping car ends, and sectional side and roof components. With these it is possible to button together basically similar types, ranging in length from 42 to 90 feet.

As a further aid to efficiency, the giants of the industry devote entire plants to the construction of one or two types of equipment. For example, Pullman-Standard's sprawling shops in Butler, Pa., use this system to produce nothing but flatcars and 100-ton covered hoppers at the rate of 60 units a day.

When it comes to off-beat models dreamed up to woo new traffic or to reduce time lost in loading and switching, builders move more cautiously. Buck Rogers contraptions don't sell, and even sure-fire revenue-uppers must be presented when the buyers' moods are right.

### **Monster auto transports**

The classic example of perfect timing occurred some years ago. The chief mechanical officer of a midwestern line was watching a parade of lightweight highway transporters hustle five sedans apiece along a public road. At the same time, 30-ton automobile cars of no greater capacity were fossilizing like dinosaurs in his home road's terminals. Why, he asked himself, couldn't a long flatcar be topped with additional platforms, to carry 15 compacts,

*(Please turn to page 218)*





**Looking a bit like a medieval torture chamber,** this room at the Manned Spacecraft Center in Houston is really not lethal at all. It's an anechoic chamber whose walls are completely covered with foam pyramids for absorbing stray radiation during spacecraft antenna radiation pattern tests. Here a test setup employs a dummy astronaut for lunar surface antenna studies.



**Quick-change artist:** A plush passenger-carrying airliner by day, the Boeing 727QC (for quick-change) becomes a cargo carrier by night, doing double duty on United Air Lines. Seats, mounted on carpeted pallets, are unlocked and moved over floor-mounted rollers to a storage van (above) and replaced by pre-packed cargo pallets in a few minutes (left).





**Banging heads together** causes no tears when children are wearing these new safety helmets developed by a German manufacturer. The soft helmets are made of a plastic that adapts itself to the shape and size of any child's head.



**Bristles** ordinarily used in brushes have been found ideal for use on the gun turrets of the Army's UH-2 helicopter. The bristles completely circle the gun ports, as shown, sealing them aerodynamically and keeping out dirt and spent cartridges.



**You won't see this strangely shaped tent** at local campgrounds—but if you're going to be in Montreal next summer, you'll find it at Expo 67 sheltering a display from Germany. The tent was developed by a German study group for industrial forms, and was presented at a recent show given by that group in Konstanz.

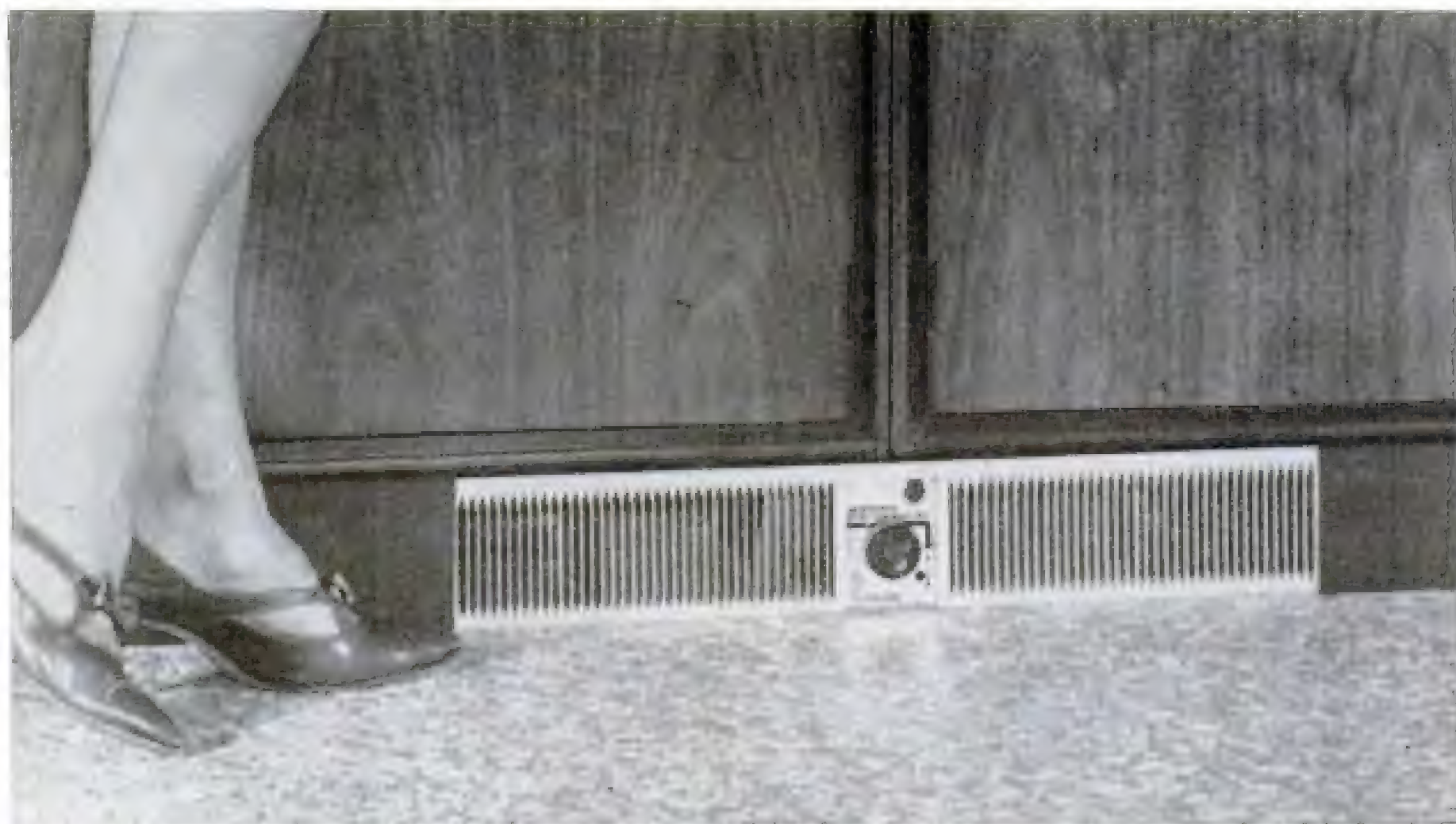




**INSECT TRAP** lures night flying pests with ultraviolet light, catches them, drops them into a disposable bag. Motorized unit clears 75-ft.-sq. area, costs \$39.95. G. S. Weaver Co., 5313 Coopermill, Dayton



**THROW-AWAY TOOTHBRUSH** with tooth powder in cleaning head lets you clean your teeth anywhere, without water. Handy for campers, guests, travelers. Pack of 20 costs \$1 from Seabarts, Box 1, Willoughby, Ohio



**HOT-WATER ELECTRIC HEATER** slides under cabinets to heat kitchen and bathroom floors and other hard-to-heat areas. The heater is safe for children and pets; it uses an electrical element immersed in water, permanently sealed in a copper tube, and plugs into any outlet. Cold air is drawn into grill center, heated, circulated out from each end. Unit is 3½ by 22 by 14 inches, and under \$100. International Oil Burner, 3800 Park Ave., St. Louis, Mo.





**PREFAB CARPORT** stands free or attaches to your home. The roof of green or white plastic is heat and light reflective; steel frames and posts are white. Unit is easy to install, allows over six feet of headroom. Each carport is roughly 9½ by 20 feet; cost is under \$500. Units are available from Thoss Products Corp., 206 West Third Street, North Manchester, Ind.



**THIS SPOON MEASURES** up to eight ounces on a spring balance built into handle. There's no need for a teaspoon of this or a tablespoon of that; ingredients may be poured or scooped in. Available in London.

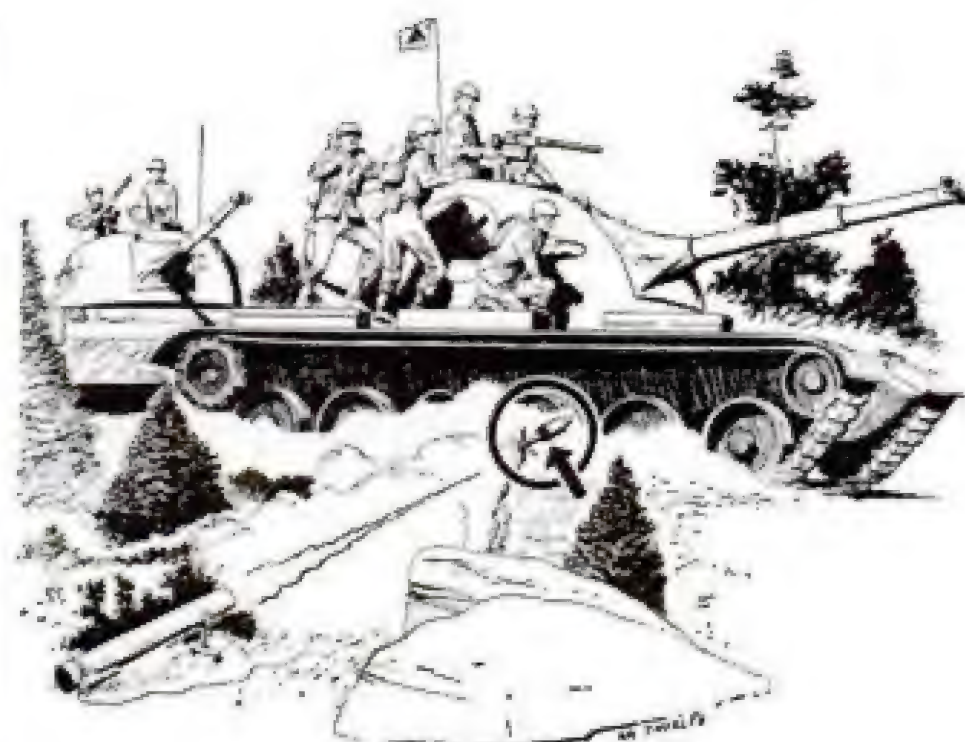


**POUR A CANDLE** with a kit containing liquid beeswax, weighted wicks, four colors and scents. Wax fits any container, lights for 65 hours. \$1; Lamplight Products, 3485 N. 127th St., Brookfield, Wis.

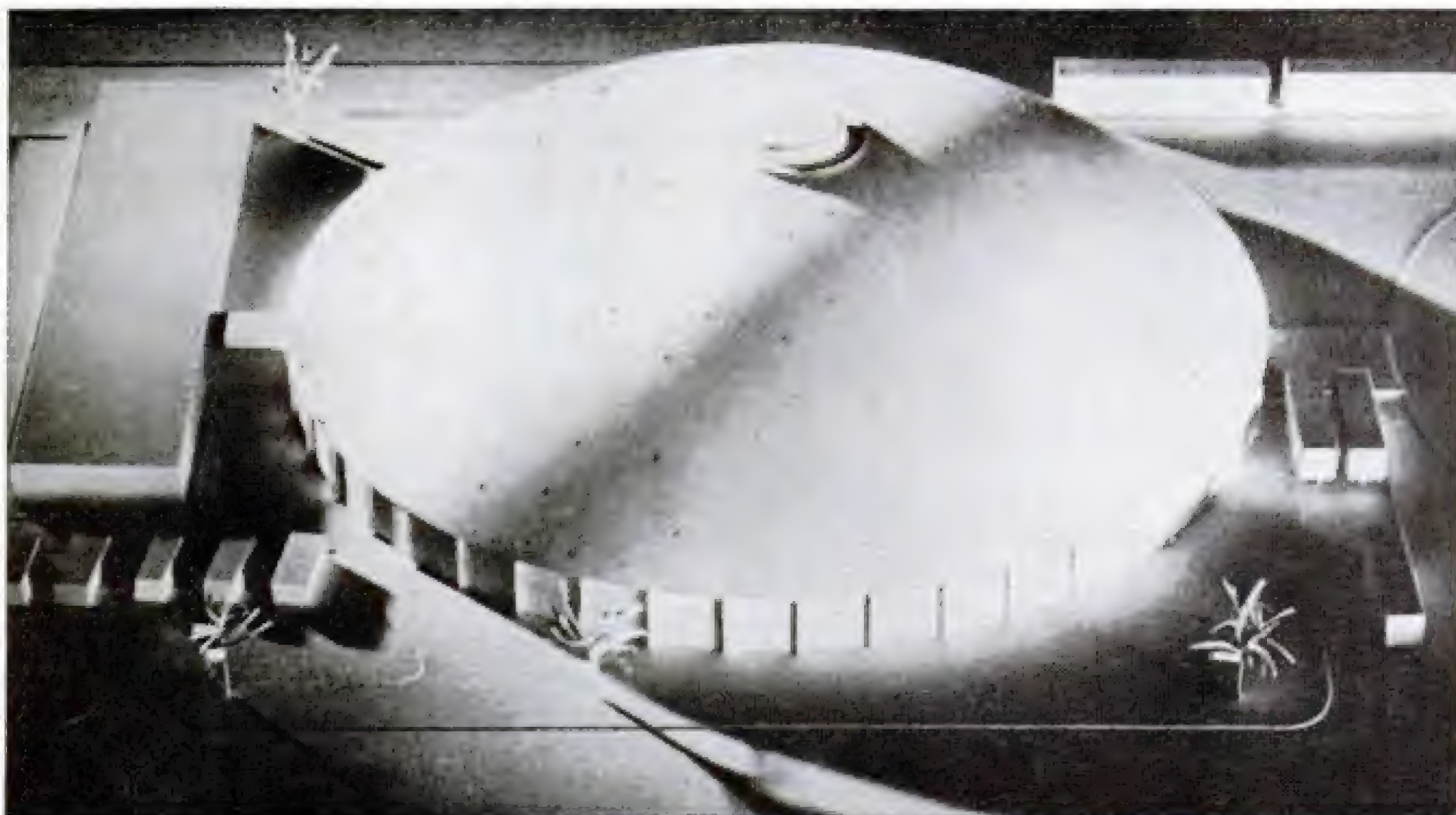




**Compact sewing kit** is included in a new ballpoint pen. Called "Sew 'N Rite," the pen has a removable barrel that contains three miniature spools of thread (white, black, and brown), needles and pins. It's distributed by Angela Gifts, 721 Hamburg Tpk., Wayne, N.J.

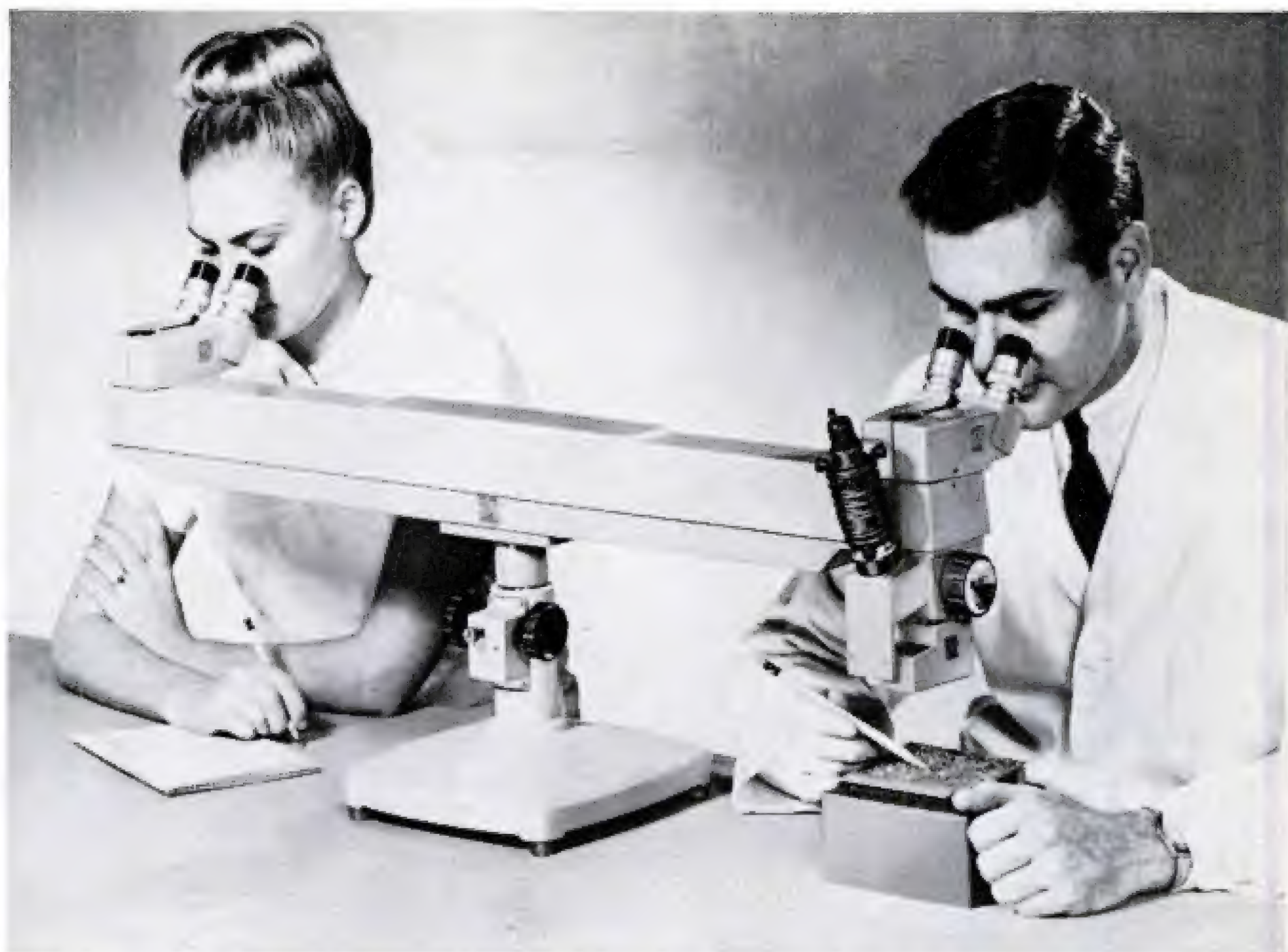


**Teaching an old bazooka** new tricks, the Army has developed a lethal antitank weapon. Fired from a plastic tube hidden at the side of a road, a 3½-inch rocket (M-28 Bazooka) is triggered by a cable placed across the road that can be activated only by a large vehicle. Weighing only 18 pounds, the weapon takes one man 10 minutes to set up and camouflage.

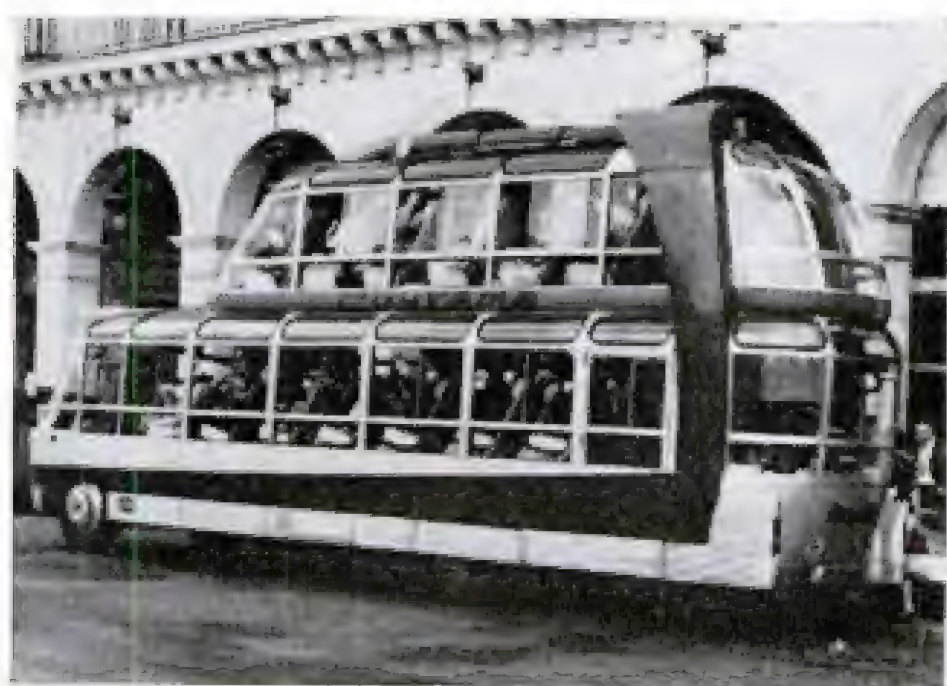


**Largest geodesic dome** ever built for industrial use features a gypsum concrete dome poured over a rigid steel frame. Designed by R. Buckminster Fuller for Carborundum Co., Niagara Falls, N.Y., the dome is 300 feet in diameter and its peak rises 100 feet on a 20-foot base to cover a completely post-free area. (Model of the building is shown above.) To pour the 900 tons of gypsum concrete over the slopes as steep as 55 degrees, workmen (left) had to use alpine ropes and harnesses.





**Microscope built for two** features an optical relay system which conveys the same three-dimensional, erect image simultaneously to both microscope "stations." Binocular bodies are mounted at each end of the housing. Manufactured by American Optical Co., Buffalo, N.Y., the twin-view microscope is especially useful as a training aid in labs.



**Sightseeing a la French mode** affords tourists a panoramic view plus comfort to match with this specially equipped bus which was recently introduced in Paris. In addition to its immense window space and aircraft-type seats, the bus has earphones that provide commentary in a choice of five different languages.



**A bowl liner** made of pyrolytic graphite (almost pure carbon) provides a cooler smoking pipe, according to the manufacturer. The liner also obviates the usual break-in period of pipes. Made by the Venturi Co., San Francisco, "The Pipe" is made in the same 4000° F. furnaces used to produce rocket nose cones. Arrows point to the graphite liner.





Flexible tube conveys gravels to sluice box or classifying areas

Cross arm contains contra-rotating weights that drive drill pipe down by sonic force

Open well

Tilt meter supports a wire line anchored to the bottom. Slight deviation of ship's position is electronically relayed to control station, and props automatically make adjustment

Sluice box

Drill pipe

Harbor master units operated automatically by wheelhouse control station swivel in any direction to keep ship constantly on station

# THE NEW ALASKAN GOLD RUSH

Bedrock

Gravel

**AUTOMATICALLY CONTROLLED** fore-and-aft swivel props keep dredging ship in position. Weighted drill pipe is driven into gravel on the ocean floor and the gold-bearing gravel is brought to the surface by compressed air, where it is run through a sluice box on the afterdeck of the ship. When ship is under way the derrick and drilling pipe lies on the afterdeck

Scouring the ocean bottom with huge vacuum cleaners, corporate "sourdoughs" are using modern technology to harvest a submarine mother lode

By  
THOMAS E. STIMSON

**A**LASKA'S NEWEST GOLD RUSH is under way. This time it's largely a submarine stampede.

There's gold for everyone, from the small part-time operator to the big, well-financed company alike.

For ordinary people, there's the story of the two young wet-suit divers from the state of Washington who cleaned up \$6000 in two weeks last summer, working a streambed in the Talkeetna range east of Anchorage.

And the story of the lone prospector who gleaned 28 pounds of nuggets from a stream north of Nome in three months. This was an "easy street" mining venture, for the bush pilot landed him within 50 yards of where



he worked. The water was less than hip deep and he picked up the gold while wearing waders.

There are lots of other examples.

But the big action is in offshore prospecting. For an example of bigtime operations, there's the Shell Oil Co., an international giant in petroleum.

It all began about six years ago when a couple of Shell engineers, landing at Nome to refuel their light plane, noticed an old beach line back of town that had been all gouged up. Asking questions, they learned that many millions in gold had been panned from Nome's golden ocean beach by primitive dredges at the turn of the century. They began to wonder if other beach lines, also rich, might exist offshore.

They remembered a report that the Western Union Telegraph Expedition of the last century, preparing to lay a cable from Alaska to Siberia, had found gold flakes on the ocean floor. They talked to local prospectors who were sure that such offshore riches exist.

The two engineers attracted the attention of company officials and a geologist was sent to Nome to investigate. He recommended more study.

As a result, when Alaska announced that it would accept applications for offshore prospecting up to the three-mile limit in 1962, Shell told its representative to get up early and be first in line. In all, more than 200 companies and individuals filed applications. Shell acquired a 5120-acre tract off Nome and since has purchased options from adjacent permit holders.

Is there a lot of gold at the bottom of the sea?

Some people think that more gold will be taken from the adjacent sea bottom than has been recovered from all of Alaska. They point out that even the ocean water off Nome has more gold in solution than in other parts of the world.

Where did the gold come from?

The Bering Sea is shallow—much of it less than 150 feet deep. During



**GRAVEL AND SEA WATER** pumped from bottom is run through sluice box on deck of prospecting ship





**WASHING BOTTOM GRAVEL**, all light material is floated off and the possible pay dirt stays in the sluice

various Ice Ages, so much water was taken up from the oceans that sometimes the Alaskan shoreline extended far out into what is now the sea. At least once, according to many geologists, the water level was so low that Asia and North America were connected by a land bridge. It was then that scientists believe the woolly mammoth crossed to North America, along with early humans who later became Eskimos, Indians and the inhabitants of Central and South America. There are other theories about the rise and fall of the shore, and the migration of animal life, but this is a broadly accepted theory.

#### **Rich streambeds**

During those times, Alaska's streams and rivers would have run many miles farther before reaching sea level. Yet ordinary erosion even then was breaking up the inland rock and releasing the native lodes of gold. There's little doubt that the present-day submarine portions of some of the streambeds are immensely rich.

This was confirmed in 1940 when J. T. Sullivan guessed that part of rich Daniels creek near Bluff may have been drowned by the sea. He estimated that its gulch might extend beyond low tide, even though it was now filled with sediment.

He started to excavate, but summer

waves kept filling in the cut. So he waited for winter, drilled through the ice and found a pay streak. He cut the ice away with steam jets and used a slack line to scoop up the gravel and haul it to sluice boxes.

His operation was described in a 1941 mining journal but no indication of the payoff was given. Unofficial estimates are that Sullivan recovered between \$200,000 and \$500,000 from four lineal feet of submarine streambed that he worked.

How much farther the gulch extends under the sea isn't known, though John L. Mero and his associates of Ocean Resources, Inc., hope to find out this summer. They hold a contract to mine the area.

It's said that every stream from Unalakleet to Grantley Harbor, a distance of 30 miles around the south side of the Seward Peninsula, carries gold—and that in the past these streams have carried vast quantities offshore.

That's why the shallow water of Norton Sound, south of the peninsula, is the center of today's offshore rush. Yet gold also is found off the Aleutians, Kenai Peninsula, Prince of Wales Island and in deep Stephens Passage, among other places.

(The sands of Gold Beach, Ore., at the mouth of the Rogue, have yielded placer gold, as have other beaches in Washington, Oregon and California. There's a sus-



picion that gold in commercial quantities may lie offshore at these sites, but the laws of the three states discourage offshore prospecting.)

Shell got busy as soon as its Alaskan prospecting permit was granted. In the summer of 1963 it made seismic surveys of part of its area with a "sparker" boat, a vessel carrying equipment that emits high-intensity electric sparks. These produce underwater sound waves which are reflected back from the bottom and from bedrock. The desire was to make a record of the sub-bottom structure. How much overburden is there? Do the contours show any old river channels even though they are now filled in? Do they show any buried beach lines?

That winter and next, Shell went out on the ice with a drilling rig to take core samples of the bottom. The unconsolidated cores (loose gravel) were lifted by compressed air, measured, and the concentrates were taken ashore where they were panned down to recover any colors. Nearly 600 cores were taken, all the way to bedrock.

This sounds like unexciting drudgery and yet there was plenty of excitement. Warren Woodward, Shell's project engineer, describes some of the problems:

"The winter ice off Nome isn't a

smooth, easy plain. The ice gets broken up and reconsolidates, forming big pressure ridges. And there are thin spots where you can fall through to freezing water. Under some conditions the whole ice pack breaks loose and drifts offshore for a few days. We carried sleeping bags and emergency rations on the drilling rig against this possibility.

"We had 23 Eskimos on the team and they are experts at reading the ice. They picked the thickest, safest ice and confirmed their judgment with a power auger. We needed 20 inches of ice under us for moving our heavy equipment, at least 30 inches for drilling platforms.

"We were out on the ice when the 1964 earthquake rocked Anchorage. A group of our Eskimos were out near the edge of the pack and when the ice began bouncing up and down under them they threw the auger on the dog sled and raced for the rig. 'Everybody get ashore,' they yelled. 'Hurry!'

"The real fear was that a tidal wave might smash the ice into small pans. We got the equipment safely ashore in a hurry. Fortunately, the tidal wave was a false alarm. The quake wasn't even felt on the beach. We were back at work on the ice as soon as we felt it was safe."

*(Please turn to page 212)*



**TESTING FOR COLOR**, a prospector pans the gravel and sand taken from a test coring. This old method is still the most effective for finding samples



**SAMPLE CORINGS** of the sea bottom are collected in buckets and then each bucket is panned out to determine if a certain area is worth full-scale work



# ROCK EER

Fast rockets and friendly rivalry set the pace as American model-rocket champions match missiles against the best of six communist-bloc countries in first international rocketry competition

By BENJAMIN GUNN



**"THIS WAS THE FIRST** international model rocketry meet; records would be established, and we felt that the United States should be represented."

On this note a seven-man team of U.S. model rocketeers penetrated the Iron Curtain to compete against six communist-bloc nations in a three-event meet sanctioned by the Federation Aeronautique Internationale at Dubnica, Czechoslovakia.

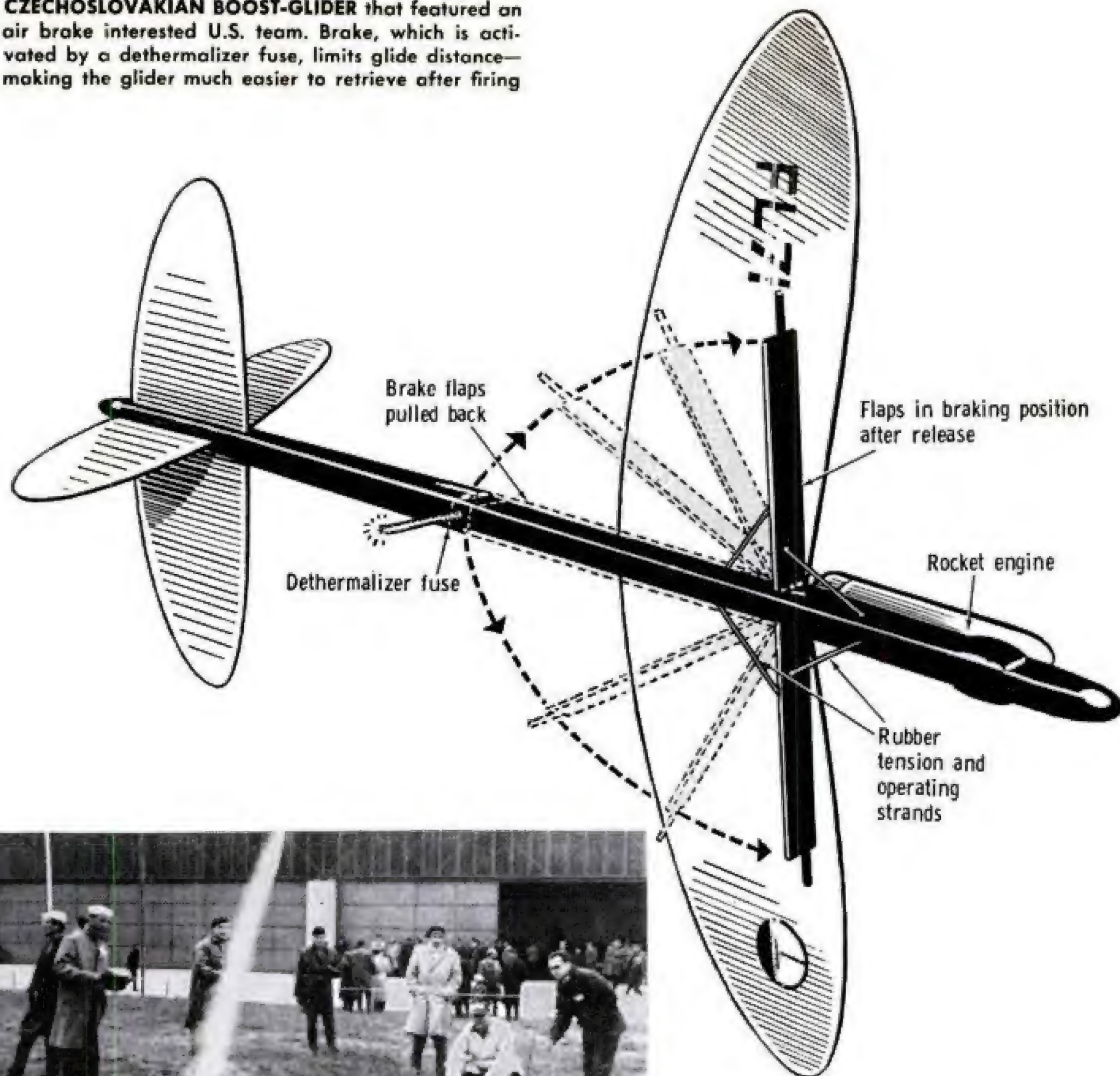
In payload competition, where a rocket of restricted engine power and total weight carries a standard payload to as high an altitude as possible, the American team took first, second and third places. The U.S. also placed second in booster-glider duration, an event judged on longest flight duration time for a rocket utilizing a gliding recovery system.

"We had a warm and friendly reception," said a member of the U.S. team, "and we like to think that we made a small step toward international goodwill."

**PREPARING HIS ROCKET** for launching, member of U.S. team establishes launching pad and affixes electric starter to the rocket engine



**CZECHOSLOVAKIAN BOOST-GLIDER** that featured an air brake interested U.S. team. Brake, which is activated by a dethermalizer fuse, limits glide distance—making the glider much easier to retrieve after firing



**BLASTING OFF**, a U.S. rocket is operated from an electric starter by A. W. Guill. When the rocket reaches its ceiling, the specially designed engine fires a forward charge that releases the nose cone and ejects a parachute for safe landing



**U.S. TEAM MEMBERS**, G. Harry Stine (left), Talley Guill and A. W. Guill, all of whom hold titles in National Rocketry Association competition, carefully fold the recovery chutes that will be inserted behind the nose cones of their competition rockets





# Dual-Purpose Step-Chest

By Alvaro A. Altomare

◀ Stand it on ready-made legs for an end table with drawers or mount it on the wall as a chic writing desk ▶

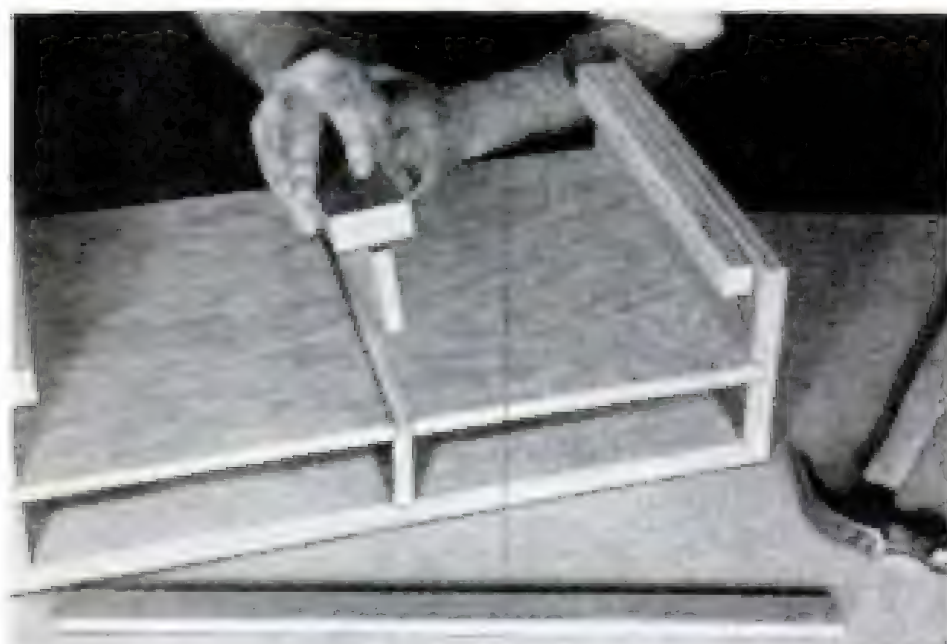
**T**HIS VERSATILE UNIT lives a double life that should content any furniture-switching wife. You can build it as a correspondence desk, hanging it near the corner of a room; then, when your wife's new floorplan calls for an end table, just lift the desk free of its wall clips, screw in tapered legs and set it beside a modern sofa. If your wife gets restless again, the legs can be detached and the unit rehung on the wall.

Your wife's a more settled type? Then just ask her which version she prefers and ignore the "convertibility" of the design.

Though a handsome example of cabinetry, this step-chest can easily be built by any home craftsman who owns a power circular saw. Accurate miter-bevel cuts are required for the "fold-over" continuous-grain effect on both the drawer hood and the aproned table, and such cuts are easiest to make on a bench saw, though—with a bit of preparation—you can also make them with a radial-arm or even a portable electric saw. These miter joints also spare you a lot of edge-taping.

After slicing the apron pieces off the  $\frac{3}{4}$ -in. table panel and beveling as shown, attach the aprons with glue and finishing nails driven in from the sides. Set the nailheads below the surface so you can cap them with wood putty. The same applies to the assembly of the drawer hood.

The  $\frac{1}{2}$ -in. pieces that form the drawer partitions are glued into dadoes. The back panel sets within the hood and is secured with glue and finishing nails. After the lower drawer guide cleats are attached with screws, join this entire assembly to the desk-table assembly by driving three



**TRIAL ASSEMBLY** shows how drawer hood fits together before glue is applied to dadoes. Note drawer-glide blocks are set back from front edge for apron

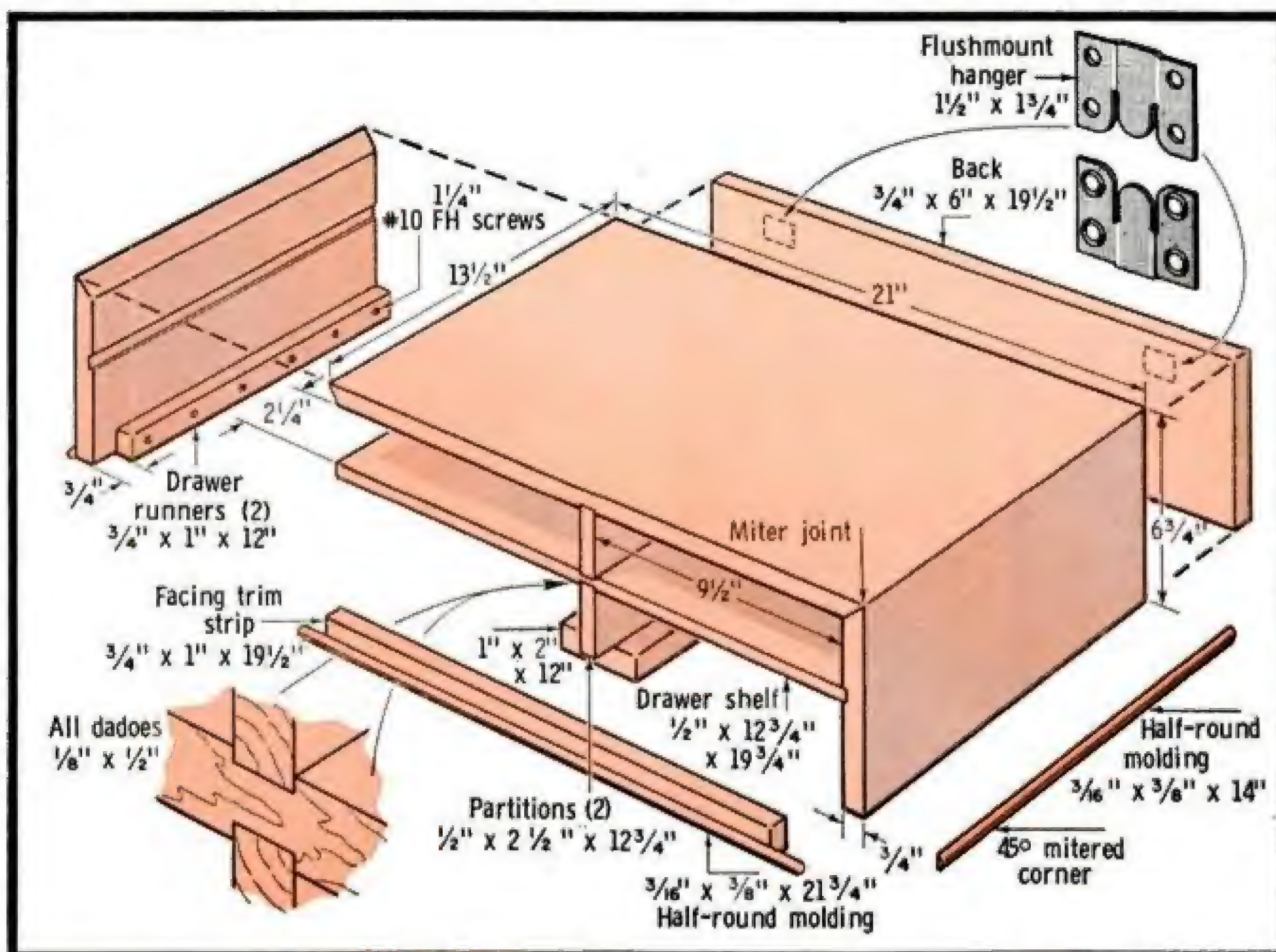


**DRAWERS FLOAT** over magazines on table because they ride on thick cleats shown in center photo. Drawers store all those small items that can stray

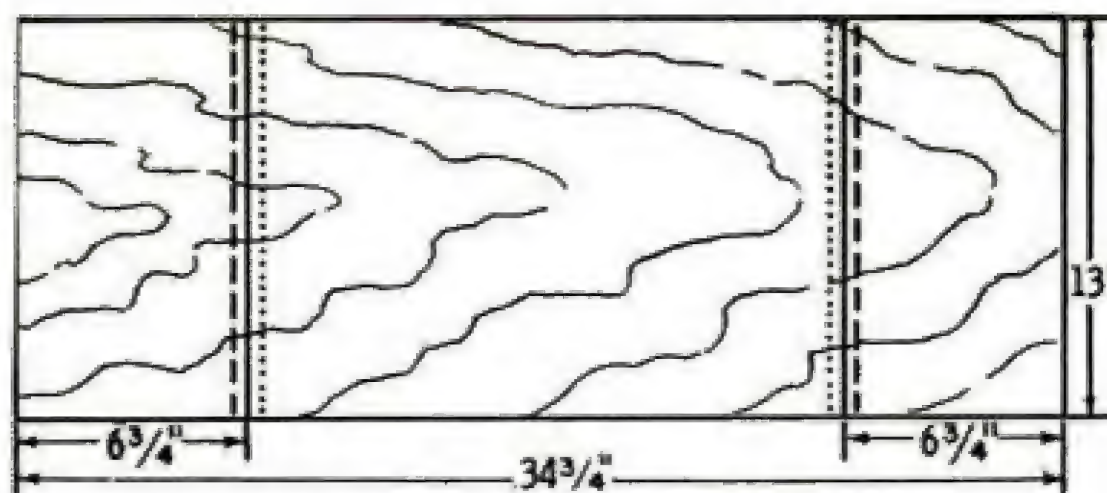




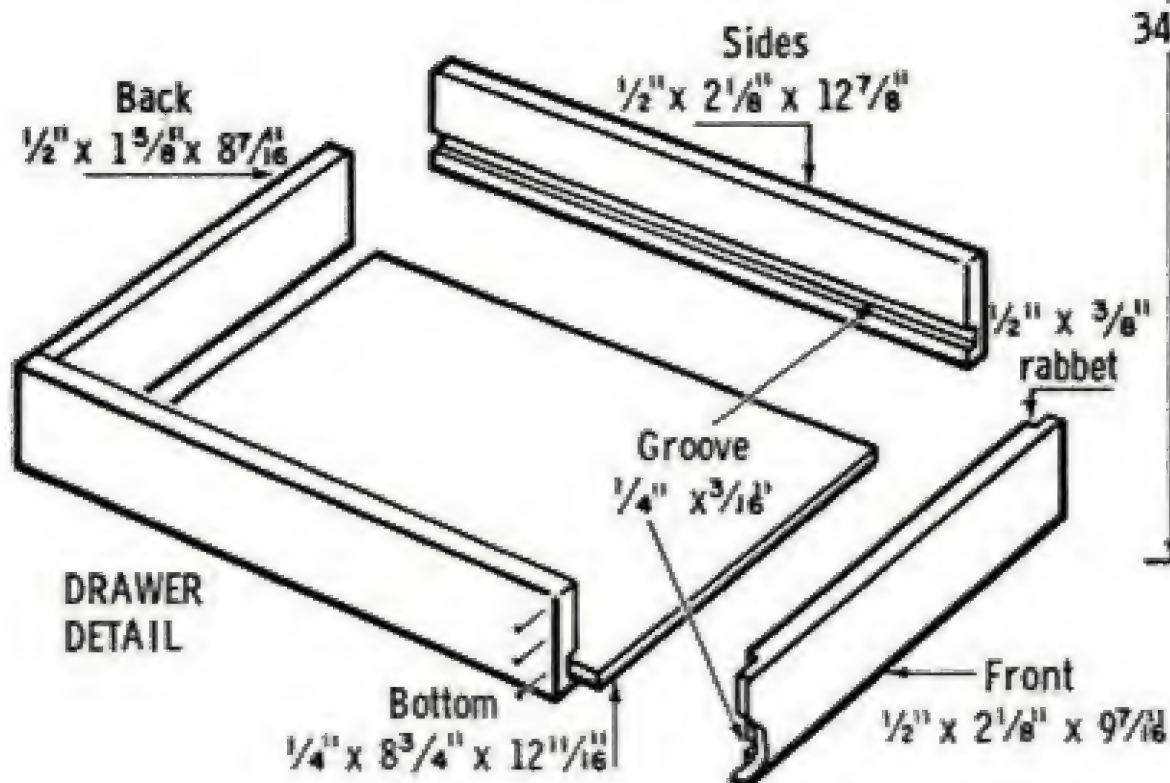
**HUNG NEAR CORNER** of living or bed room by means of two-part clips, unit creates a correspondence center





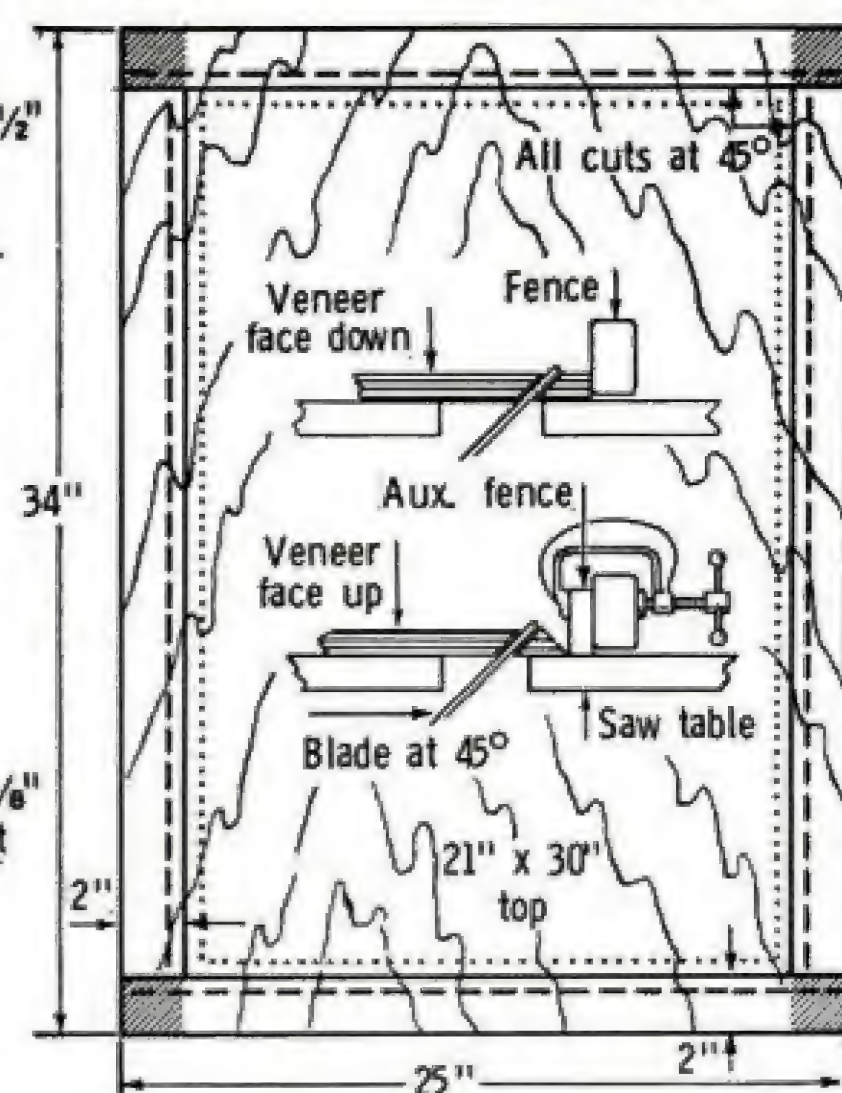


LAYOUT OF DRAWER HOOD



DRAWER  
DETAIL

Cut on solid lines, with bench saw set at 45°. Dash lines indicate resulting bevels toward underside; cut dotted bevels on subsequent passes



LAYOUT OF TABLE BASE  
(Shaded areas are waste)

2 1/2-in. FH screws through the bottom edges of the long aprons up into the sides of the hood. The clearance holes through the aprons should be counterbored to the depth of an inch so that the screw heads seat deep within the aprons. The finishing touch is provided by three mitered strips of molding applied at the joint line.

The drawer fronts in the unit shown are made of solid white maple, finished

natural to provide a contrast with the walnut-veneered plywood of the carcass. You slide the drawer bottom into the grooves in the side and front *after* the drawer is assembled; don't glue this panel, merely fasten it with 3/4-in. box nails driven up into the drawer back.

Pulls are optional: The drawers are of a length that causes them to project just enough to provide a finger grip. ★ ★ ★



**TABLE-DESK PANEL** is 3/4-in. plywood with all four edges sliced off and mitered (as shown, top right) to serve as aprons. Trial-assemble before you glue



**CONVERSION TO TABLE** is simple matter of attaching socket plates at four corners and screwing in ready-made legs—removable if you change your mind later



## Rub-on patterns end tracing

**M**OST OF US have artistic impulses beyond our abilities to draw or design (that's why paint-by-numbers kits are popular). In the field of small decorations, particularly—on tiles, furniture, glass, metal, leather or cloth—there's long been a need for a "universal" transfer process that would let you apply professional patterns directly to any flat or curved work surface by mere rubbing—without carbon paper—as a guide for painting, tooling, wood-burning or carving.

Dean Designs, Box 686, White Plains, N.Y., has just launched just such a process and is offering *PM* readers an introductory kit of 12 assorted patterns, each with a color-suggestion guide, plus release solutions, for \$3 ppd.

Because this new process fills a special need on hard surfaces, it's ideal for ceramic applications. But the same designs can be applied anywhere, and the transfer process remains the same. You just dip the pattern into solutions mixed (from the two chemicals supplied) in shallow dishes such as soup plates, drain, blot, then burnish onto the workpiece. A thumbtack stuck in a pencil eraser makes a good burnishing tool, as shown in the sketch at right. ★ ★ ★



### *Translucent garage door helps light both inside and outside*

This extra-light, one-piece garage door of fiberglass lets the garage share both inside and outside light. Being translucent, sunlight shines through to illuminate the interior during the day, whereas interior lights shine out through the door to help illuminate the outside at night. Because of its fiberglass covering, the door is featherweight. Taylor Garage Door Co. of Detroit makes it.



### *Wall register automatically regulates both warm and cool air*



Whether the air is biting cold or hot, heavy or dry, a unique wall-mounted register is available which automatically regulates the air flow to make your home more cozy in winter, cool in summer. Containing a temperature-sensitive element, it takes the guesswork out of manually setting the air flow to provide the ultimate comfort from both central heating and air conditioning. It's offered by Sears Roebuck.



# Concrete by the Bucketful

By MANLY BANISTER

**W**HEN THE JOB requires a yard or two of concrete, stepping to the phone and ordering it already mixed is certainly the simplest way. But when the minimum amount that they'll deliver is ten times more than you'll need to set a yard-light post or patch a driveway, this small-batch portable mixer comes into its own. The mixing bucket is the dumping bucket, since once the concrete is mixed, the bucket can be lifted out and the mix poured directly into your form.

The bucket can be a 5-gal. paint or chain pail; make sure it has a sturdy handle. Since the bucket is tilted at a 45° angle, less than half of its volume may be utilized for mixing. The mixer will

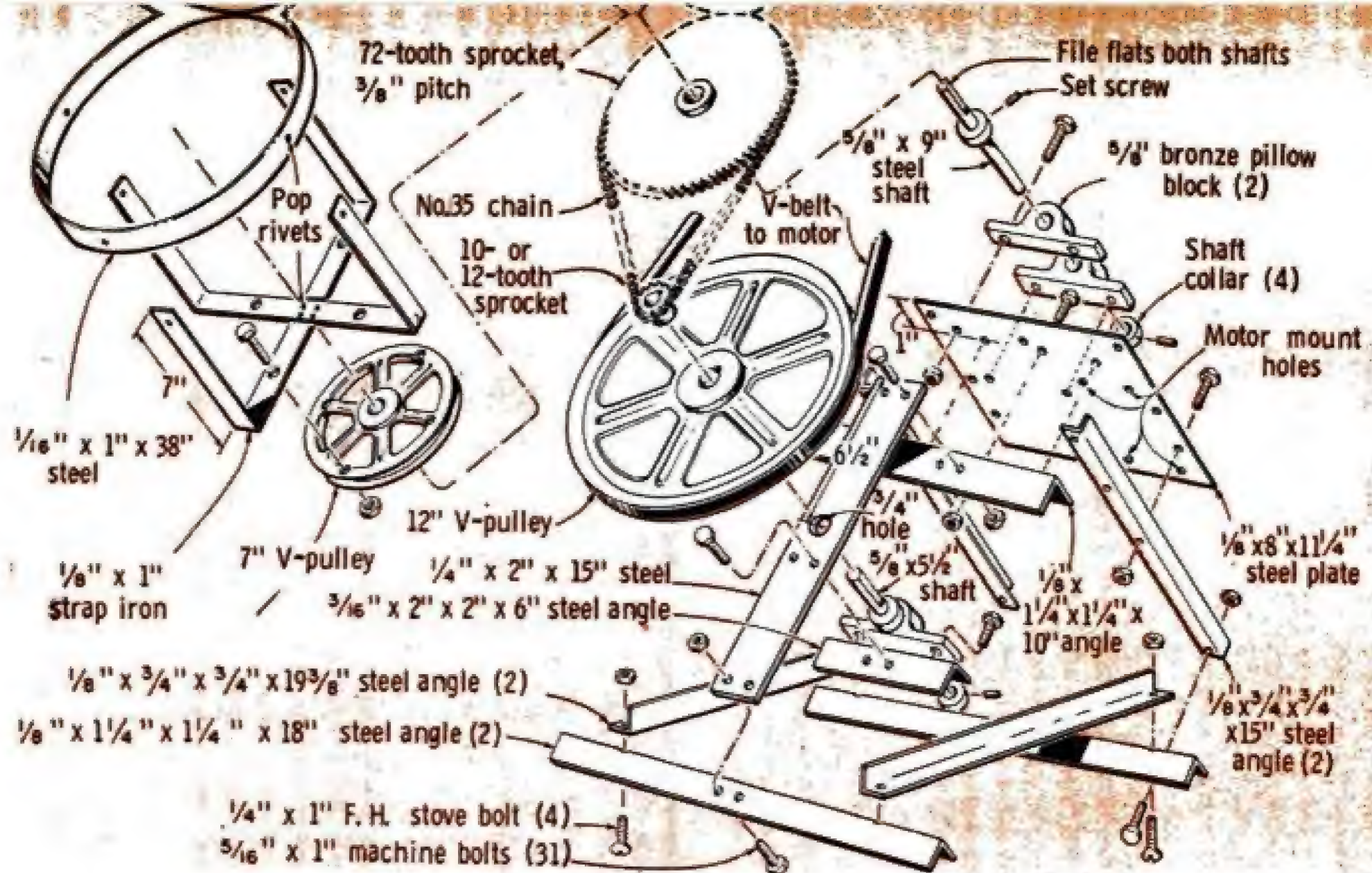
churn out about  $\frac{1}{3}$  cubic foot of concrete at a time. A good mix would be 7 lbs. of cement,  $\frac{1}{6}$  cubic foot of sand,  $\frac{1}{4}$  cubic foot of gravel and  $\frac{1}{2}$  gal. of water.

A  $\frac{1}{3}$ -hp washing-machine motor will power the mixer nicely. You'll also need bicycle sprockets and chain, or the  $\frac{3}{8}$ -in.-pitch sprockets used here, bronze-bearing pillow blocks and a 12-in. V-pulley. Also a 7-in. pulley just to provide a collar for attaching the basket to the drive shaft, a  $1\frac{5}{8}$ -in.-motor pulley, steel angles and plate, strap iron and cold-rolled steel for shafts. The choice of sprockets and pulleys must be based on a speed reduction from motor rpm to 40 rpm or less for the bucket. Machine bolts, stove bolts and



**RIGHT FROM THE MIXER** into the form for a birdbath footing goes this batch of home-brewed concrete





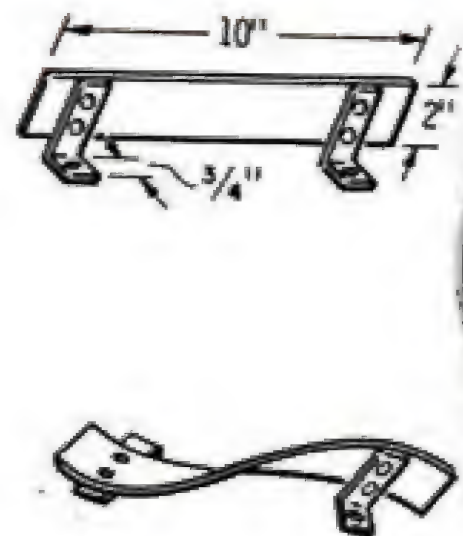
rivets are used for joining, but  $\frac{3}{16}$ -in. stove bolts can replace the rivets.

The bucket basket is assembled with Pop rivets and joined to the 7-in. pulley with  $\frac{1}{4}$ x1-in. stove bolts and lockwashers. If you don't have such a pulley on hand and can weld, it will be cheaper to weld a 6-in. square of  $\frac{1}{8}$ -in. steel to the bucket drive shaft. If you use the pulley, file a flat on the shaft long enough to include the hubs of both pulley and large sprocket. The same goes for the end of the 12-in.-pulley shaft, which also accommodates the small sprocket. The single pillow block for this shaft should be non-self-aligning.

The frame is put together with  $\frac{5}{16}$ x1-in. machine bolts and  $\frac{1}{4}$ x1-in. stove bolts.

The mixing blades in the bucket are stationary and are designed for clockwise rotation. Cut the three blades from 16-ga.-or-heavier sheet steel and rivet or bolt on the strap-iron or corner-iron stanchions about  $\frac{1}{2}$ -in. from each end.

Bend each blade by hand away from the stanchion side, with slightly more of the curve toward the end that will be facing the open end of the bucket. Grip this outside end in a vise and twist the opposite end clockwise until the right-angle stanchion feet rest flat on the curved bucket wall. Install the blades with rivets or  $\frac{1}{4}$ x $\frac{5}{8}$ -in. machine bolts. With the latter, flow solder around each bolt head on the outside to prevent leaks. ★ ★ ★



**MIXING BUCKET** is equipped with stationary blades that are bent by hand and bolted or riveted inside



**FINISHED MIXER** sports a removable mixing bucket that delivers  $\frac{1}{2}$  cubic foot of concrete at a time



# Put a Pole-Lamp Table at Your Elbow

**I**F YOUR POLE LAMP lacks a table, you're usually stuck. Such tables normally fit between pole sections designed to accept them. But if you have a lathe, you can make a fine hardwood table to fit any pole lamp.

Cut a 6-ft. length of  $\frac{3}{4}$ x5-in. walnut into 18-in. lengths. Then edge-dowel and glue them together. Cut an 18-in. disc and save the corner scraps for brackets.



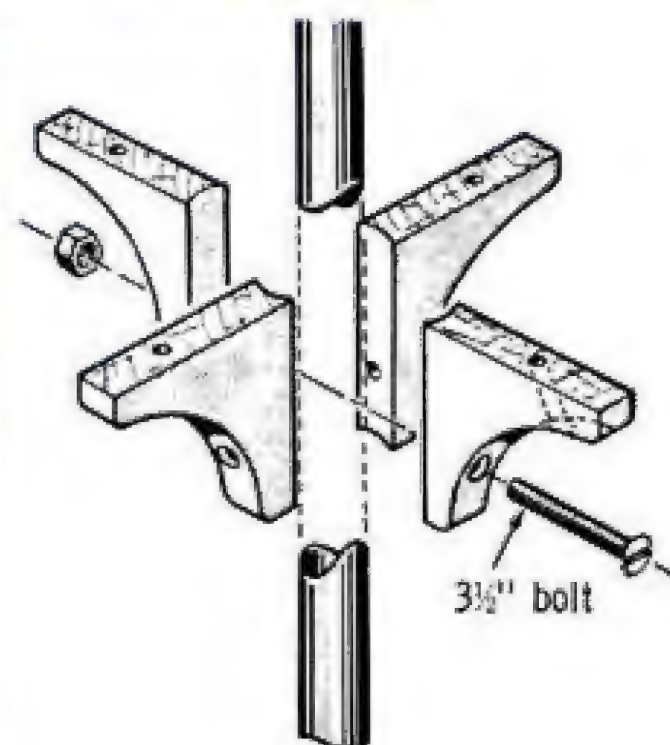
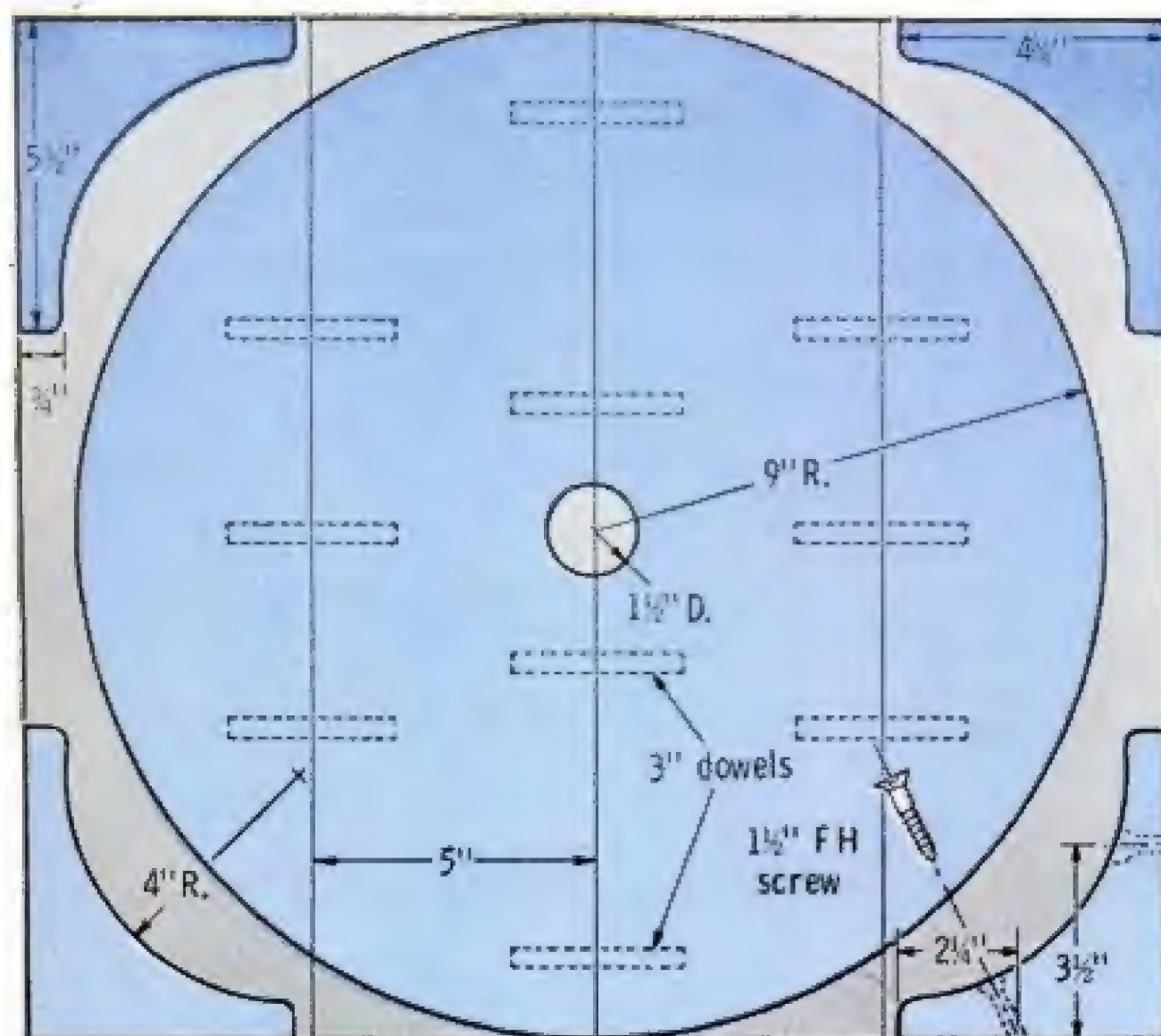
Attach this disc to a faceplate and mount it on the outboard end of your lathe headstock. Run the lathe at slow speed and true up the disc and bevel its edge. Then drill a hole in the center for a snug fit on the pole, approximately  $1\frac{1}{2}$  in. in diameter. Sand it glassy smooth. The joints will disappear.

With the scrap pieces stacked, bandsaw them to the pattern shown. Drill a No. 8 hole in each bracket  $1\frac{1}{2}$  in. in from the end of the top leg and perpendicular to the curved face, then countersink flush. Clamp opposite brackets together and drill  $\frac{1}{4}$ -in. holes through from one curved edge to the other. Note that the pairs of holes do not line up since the bolts used must bypass each other in the pole. These are  $3\frac{1}{2}$  and 4-in. F.H. brass stove bolts. For such sizes, see your marine hardware dealer. Countersink one end of each bolt hole so that the lower edge of the screw-head will be flush. At the opposite ends, counterbore recesses to wedge the nuts in the holes.

Wrap a piece of dowel or pipe the same diameter as the pole with sandpaper and form a concave groove in the edges of the longer legs of each bracket.

With the dowel positioned between the brackets so it falls short of the bolt holes and pokes through the pole hole, glue and screw the brackets to the underside of the

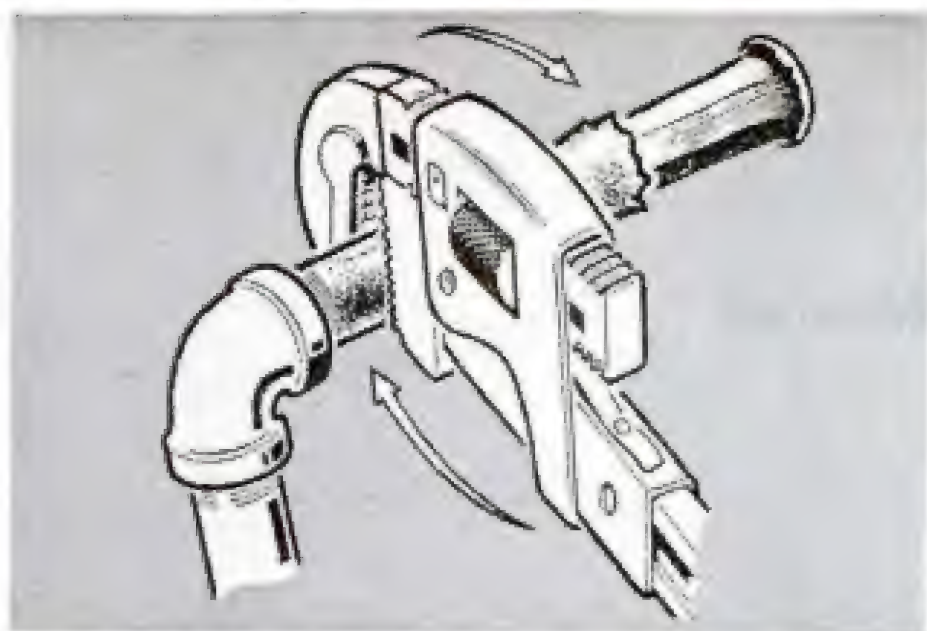
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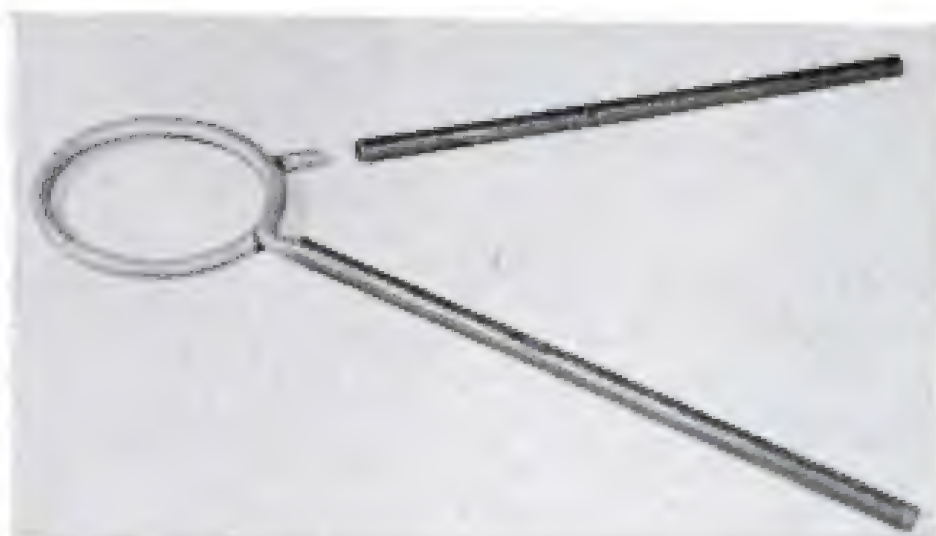
**BEFORE DOWELING**, mark the disc outline on the clamped boards so the dowel holes may be positioned where they will not run through the edge of the disc. The brackets, cut from corner scraps, are mounted via bypassing brass stove bolts



## Backing out rusted pipes



When rusted-out pipe is likely to flatten, twist or crush under the bite of a pipe wrench, you can easily remove it from the fitting with the aid of a cold chisel or punch. Simply cut the pipe a few inches from the fitting, drive the chisel in and apply the wrench.—*J. R. Walker*



## Nonslip clamp spreader

The frustrating job of opening spring-wire hose clamps is made easy with two steel-tubing handles which will slip snugly over the wire ends. If you don't have tubing, you can make similar handles by drilling holes in the ends of two steel rods. In each case, you grip the handles as you would pliers.—*Walter Hastings Jr.*

## Tape dispenser makes drywalling easier for the beginner

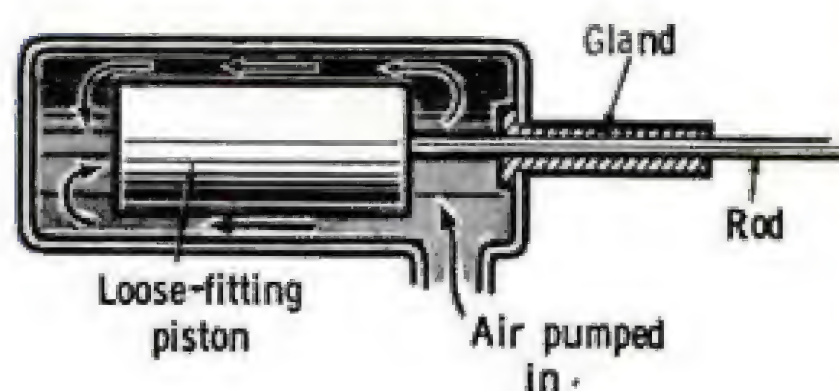
The home remodeler, lacking the experience of a pro, will find that the taping of drywall joints goes faster with a home-made dispenser which uniformly butters the tape as it's pulled off the roll. The hopper which holds the joint compound has a slot at each end through which the tape passes as it unwinds from a broomstick spindle. As the tape is pulled through the compound slurry, the coating thickness is regulated by the size of the exit slot you make in the end of the dispenser.—*Harry J. Miller*

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## Can you explain it?

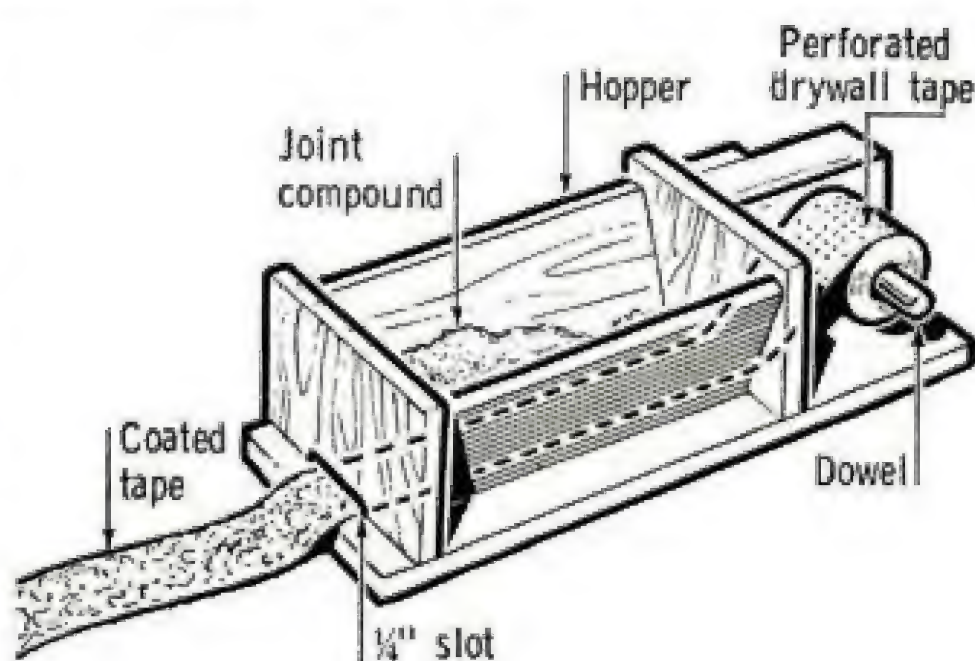
By Hank Hilton

While working on the displacer cylinder for a model hot-air engine, something struck me as odd. The piston was a very loose fit inside, with its rod passing through a fairly airtight gland. When I pumped in air to test it for leakage, I realized that the air was flowing all around the piston as shown in the sketch, exerting equal pressure on all sides. So why did the piston move—and can you guess which way it went?



The piston moves toward the gland. Although the air pumped in is at equal pressure all around, it exerts more pressure on the piston's free end than on the end toward the gland. Why? Because the area on the gland end is reduced by the cross-section of the piston rod which, since it extends through the gland, isn't subject to internal air pressure. The effective pressure (pressure times area) is thus greater on the far side of the piston where the force bears against the full area.

ANSWER

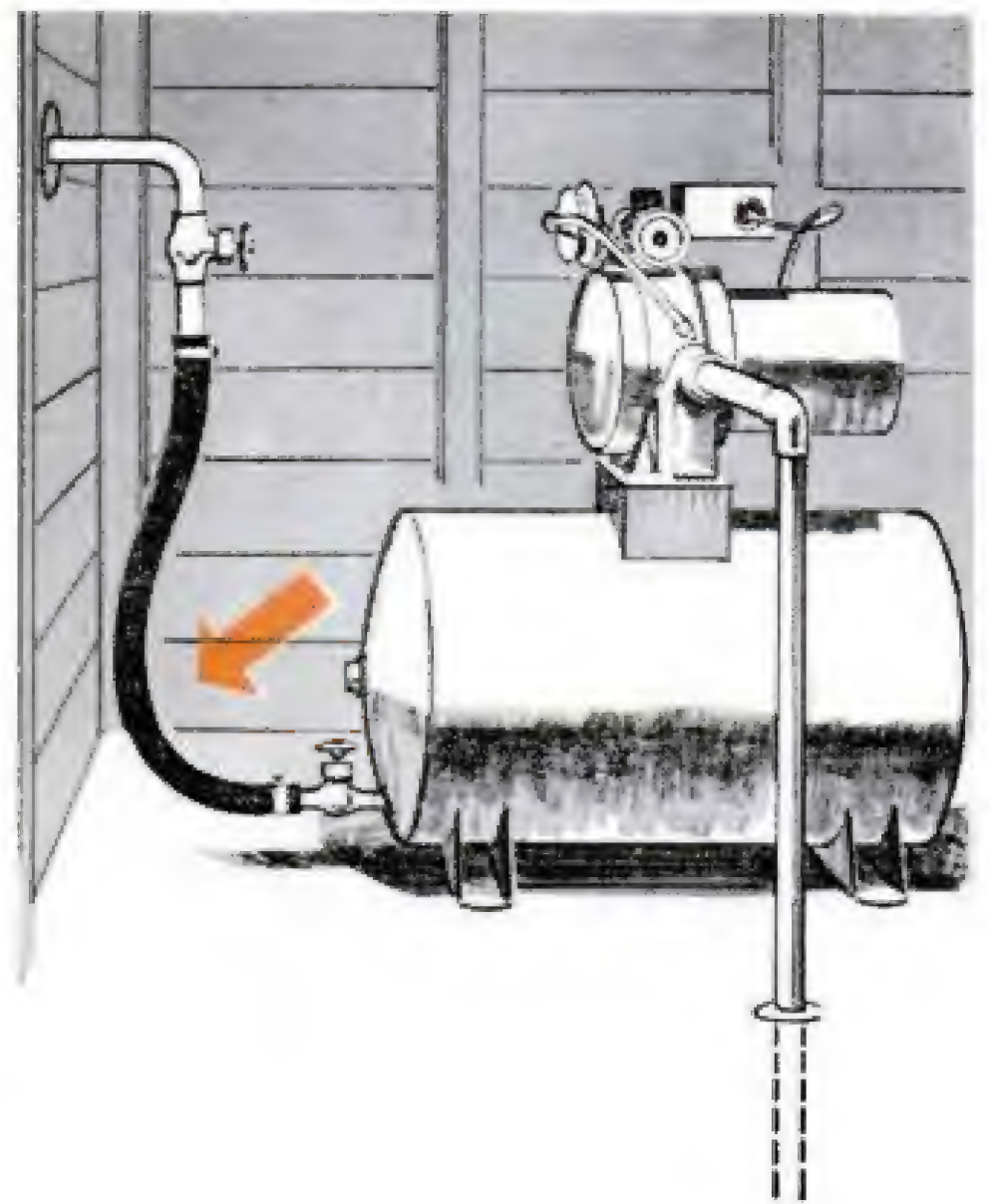




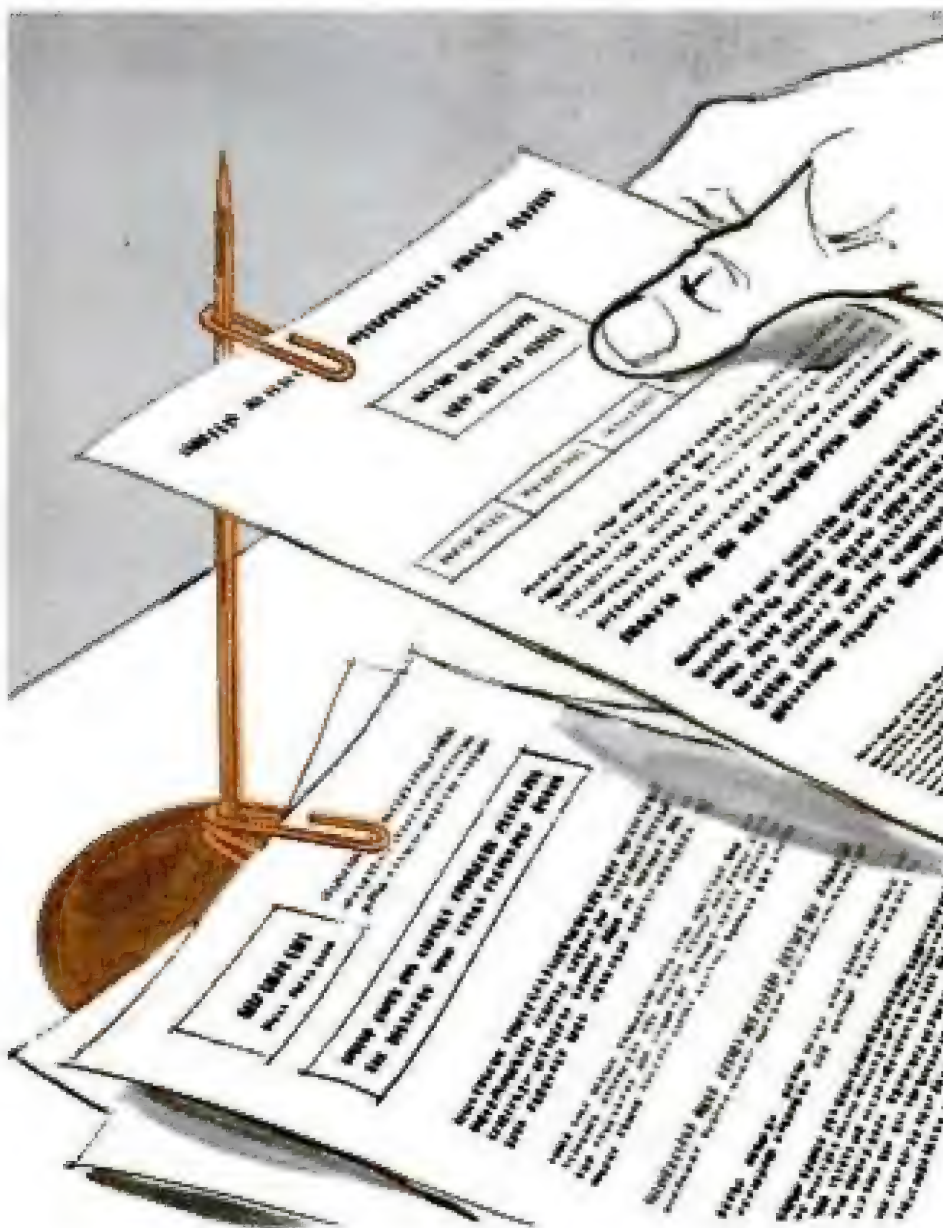
# Solving home problems



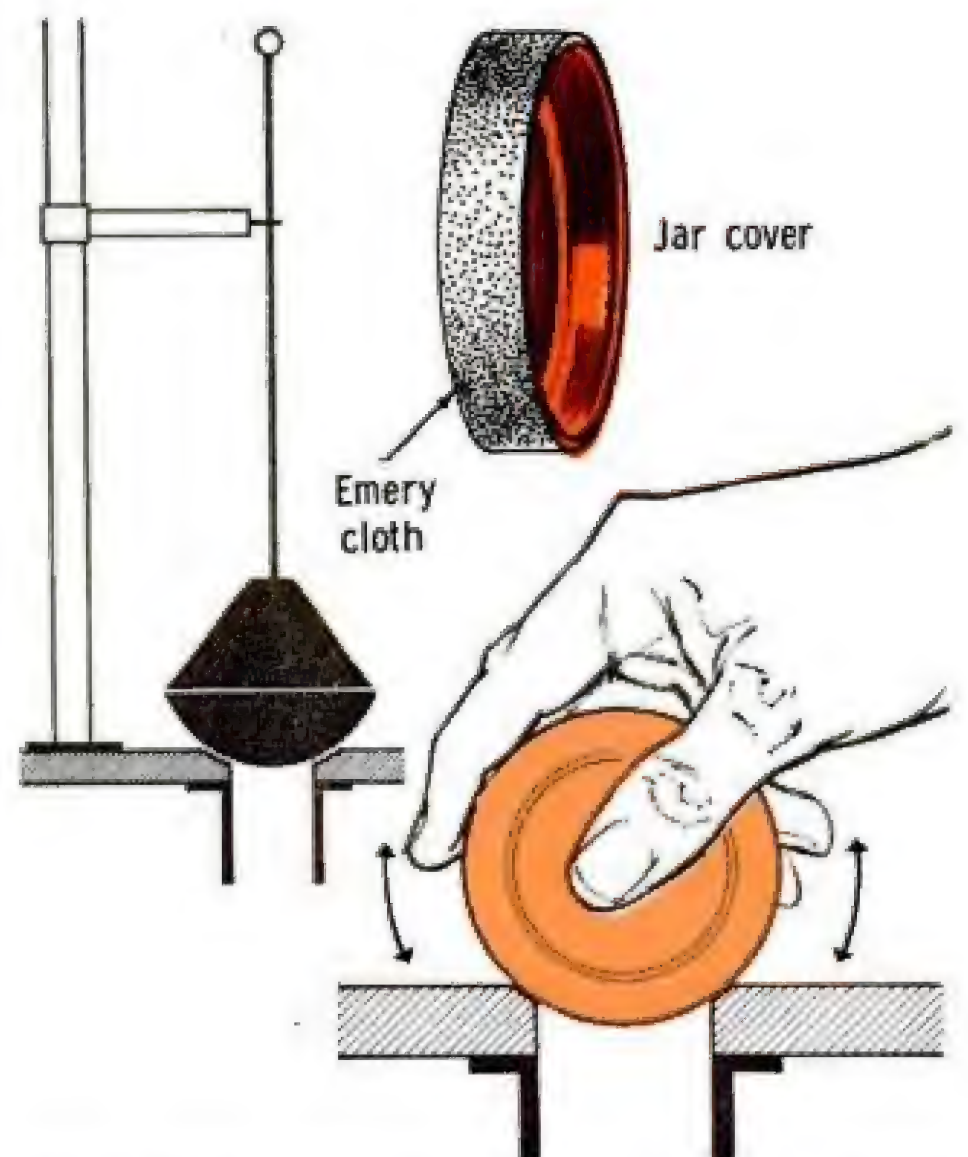
**WASH RACK** for storm windows rests against the house, raises window to a convenient working height so you can wash it without stooping. Make it from any scrap lumber, adding cross bracing as needed



**STOP PUMP NOISE** from being transmitted into the house via water pipes by using a good grade of hose instead of pipe to couple the main supply line to the pump. The hose will act as a sound insulator



**INSTEAD OF JAMMING** notes and papers down over a file spike in the usual manner, try using paper clips as hanger rings. This will allow you to remove any paper without having to pull off all those above it



**LEAKY FLUSH TANK** caused by corrosion on the ball stopper seat can be repaired by resurfacing the seat using a household jar cover wrapped with emery cloth. Radius of jar cover should match that of ball

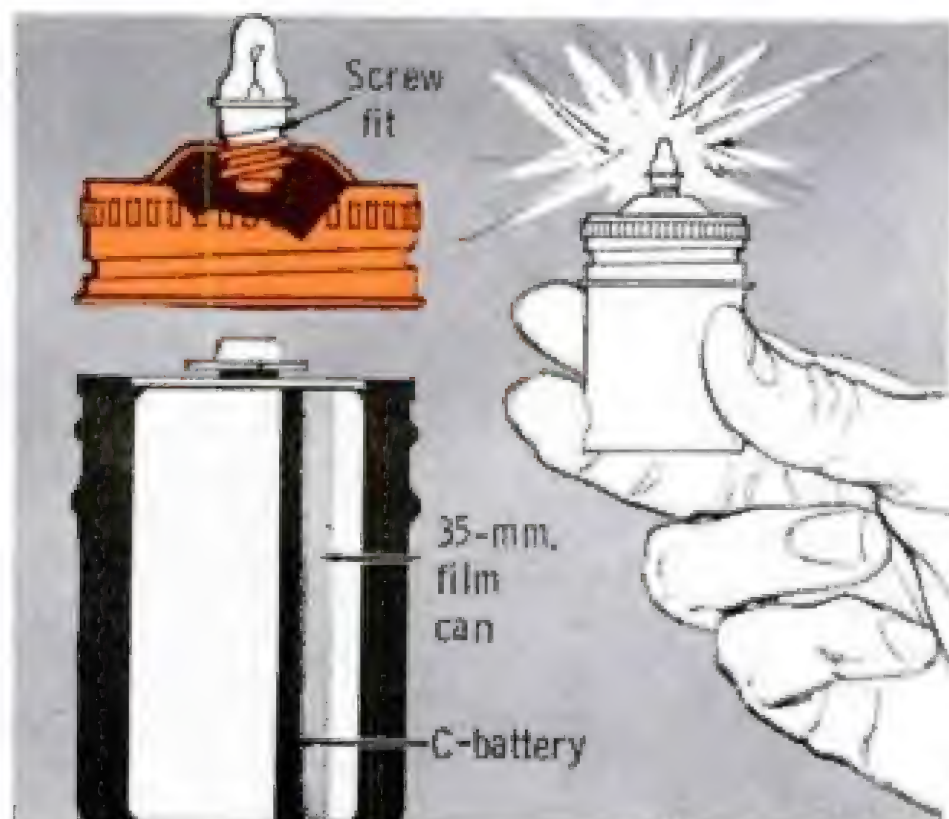




**QUICKIE CLOTHESLINE BIRD FEEDER** can be hung out away from trees to keep it safe from cats. It's just a cardboard box cover slipped through wire coat hangers. Bend hangers as necessary and tape to cover



**LEFTOVER PUTTY** won't dry out if you save it in a wide-mouth jar filled with water. Roll the putty into a ball to draw the oil to the surface, place it in the water and screw the jar lid down tight



**ELECTRIC CANDLE** to provide standby light when power fails is just a battery inside a 35-mm film can with a flashlight bulb wedged in a hole in the cap. Bulb contacts battery when the cap is twisted

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**IF YOU'RE BOTHERED** by birds perching on tomato stakes and leaving droppings on tomatoes, just place a conical paper cup over the top of each stake and secure it with a thumbtack. It'll last all season



**FETCHING THE MAIL** is a fun job for small fry (and a step-saver for mother), but often the little mailman is too short to open the box. Remedy this by installing a doorpull on the door, as illustrated

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# 6-Way 'Theater' Wall

*Without stirring from your easy chair, you can treat your guests to a wide variety of home entertainment from this built-in projection center with its own electronic brain*



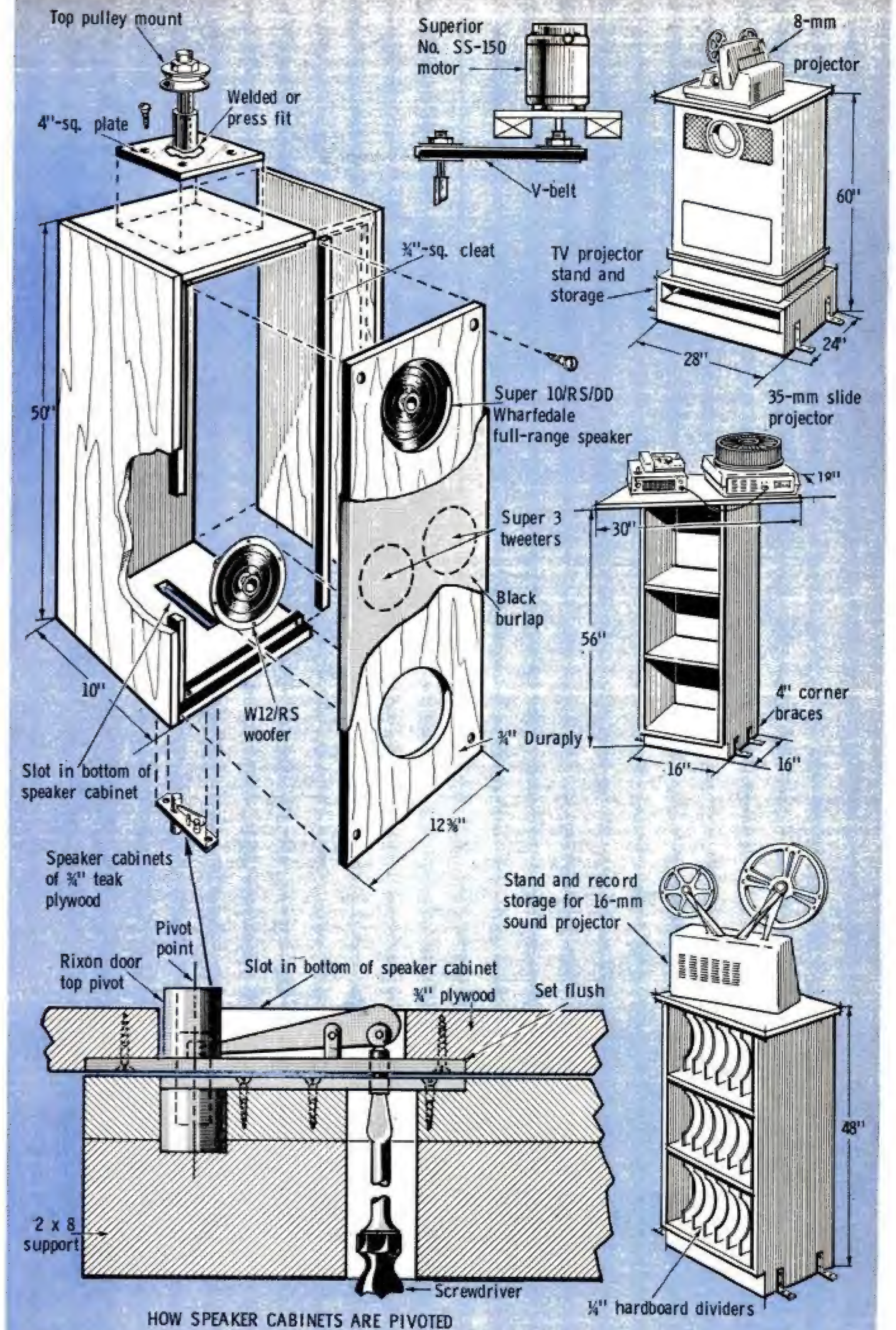
**WHEN NOT IN USE**, theater wall is unbroken expanse of teak paneling lighted by three "wallwasher" fixtures in ceiling. Sliding panels are veneered doors

**D**INNER OVER, you and your guests settle in the living room. You push a button and your home is suddenly transformed into a professional theater. Lights dim, drapes close to mask outside distraction, two center sections of a handsome paneled wall slide apart to expose a four-foot-square screen. Depending on which button you have pushed, a slide, movie or television picture leaps to life by means of rear projection. If sound is involved, two side panels of the wall rotate to reveal speakers, and these continue to turn toward one another until they reach the ideal angle for top-quality stereo.

And that's not all this miracle wall contains: Below the screen is a built-in, re-











**OPENING FOR TV SET** is cut beneath screen with saber saw, and  $\frac{3}{4}$  x 4-in. solid teak strips are mounted with glue and finishing nails so front edge protrudes  $\frac{1}{4}$  in.



**REMOTE PUSHBUTTON UNITS** plug into wall panel for hand control at host's chair. Top connector is for TV projector; lower one controls hi-fi, other units

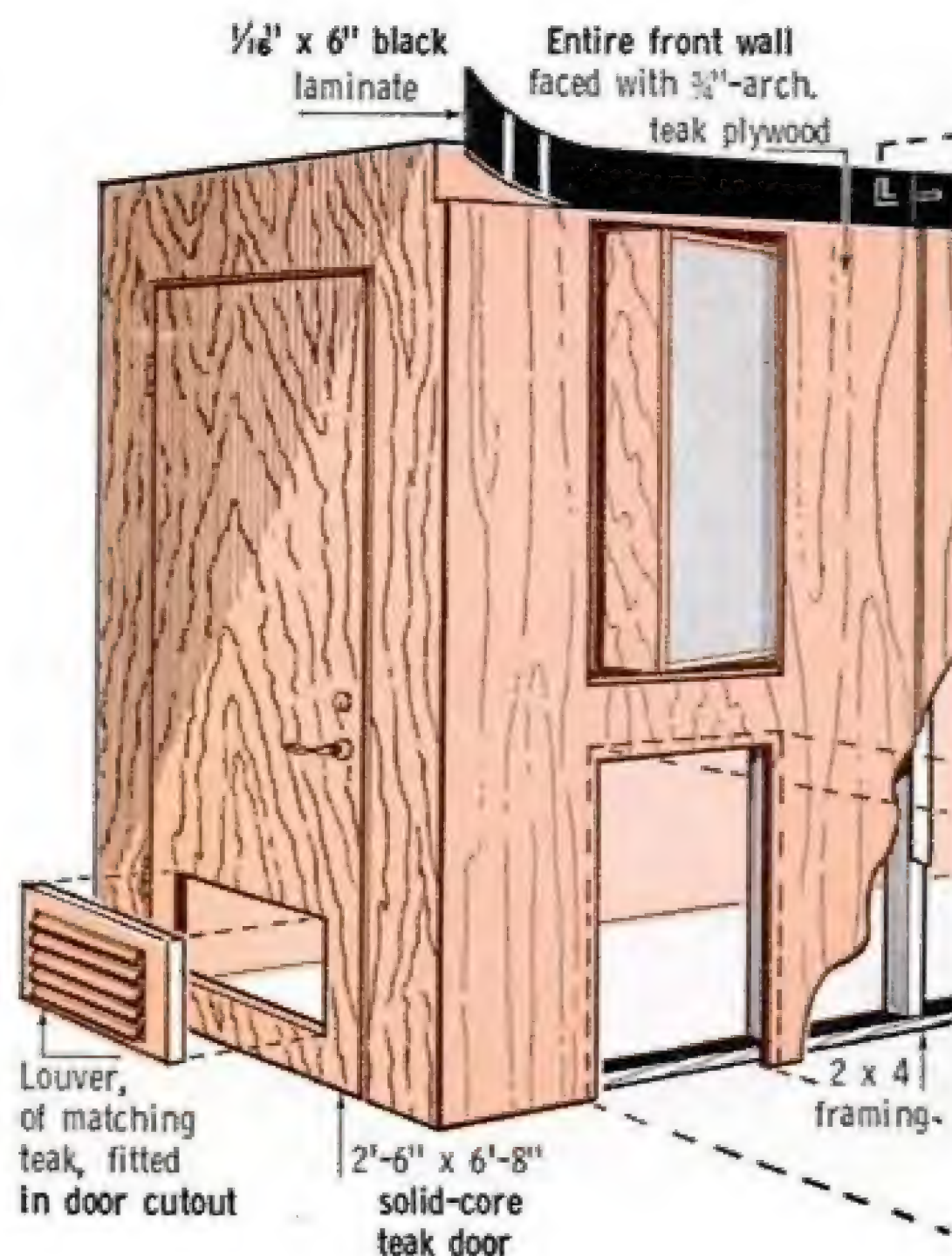


**FOUR HANDSETS** you operate from your chair let you adjust hi-fi volume and tone, start, stop and focus projectors—even change slides for "live" narration

mote-controlled color television set. And behind it are hi-fi components for playing records or tape.

The wall is another ingenious feature of the "house of ideas" in Westport, Conn., conceived and executed by noted designer, Bill Baker. We gave you plans for a glamorous home bar and swing-down kitchen cabinets from the same house, in our September issue. Here we detail the liveliest wall of the house for your home-improvement inspiration. It's unlikely you'll want to duplicate it feature-for-feature, but the wall is so packed with novel ideas that you can select only those that will adapt to your own living room or den.

Perhaps the most appealing feature of all is the projection and sound room behind the screen. Imagine how much more often you'd be inclined to show your slides or movies if you didn't have to go through the struggle of setting up projector and screen, each time. With a set-up similar to Baker's, you can have the evening's entertainment preprogrammed—projectors





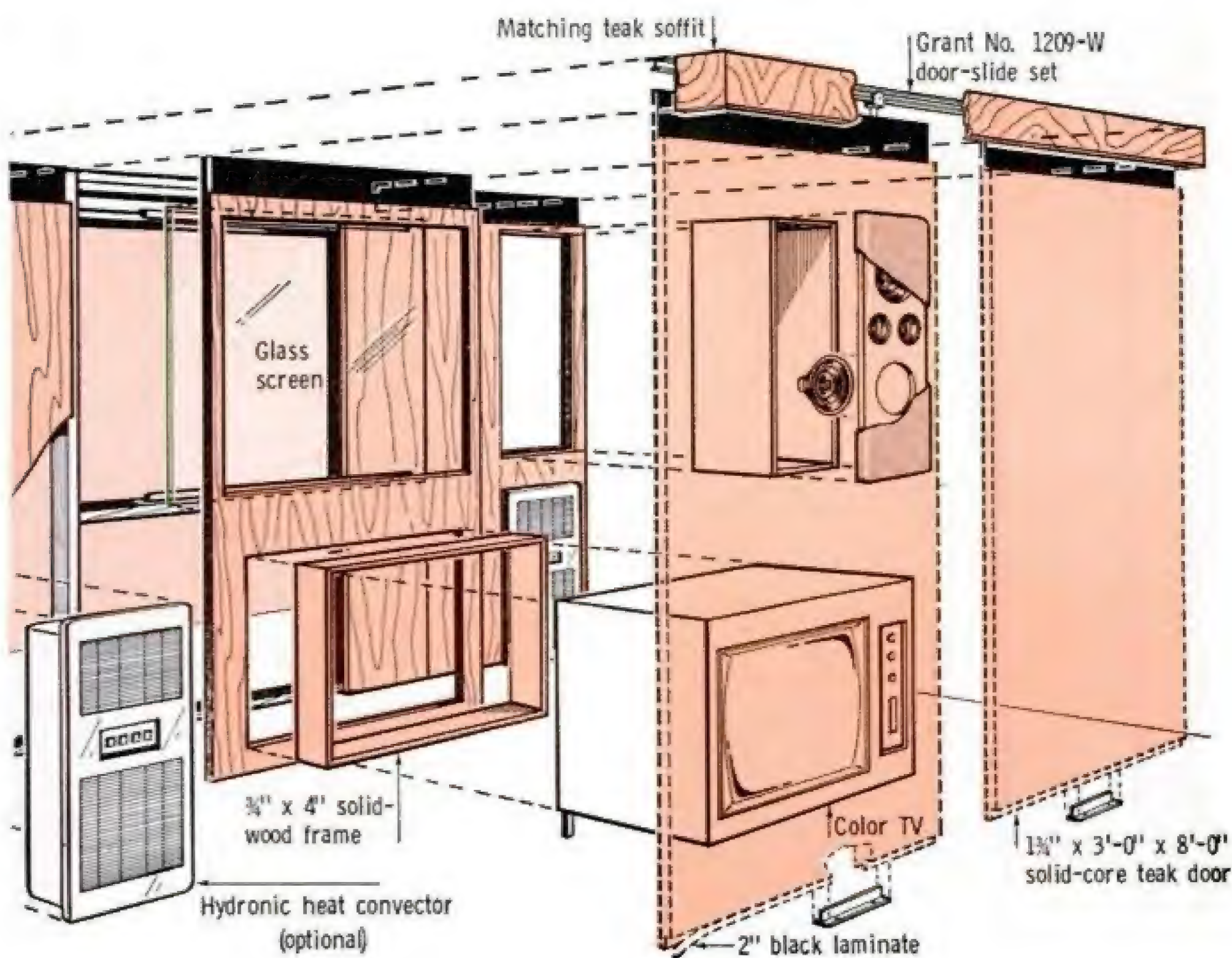
loaded and focused and ready to roll—hours (or even days) before guests arrive. And when the show begins, you're out front enjoying it *with* them. If it's a slide show, you can have your commentary or background music set up on a tape recorder equipped to trigger each slide change—or you can hold a conventional remote-control unit to change slides as you deliver a "live" narration.

As a bonus, *rear* projection neatly solves the problem of projector noise, since all equipment is tucked out of sight and earshot.

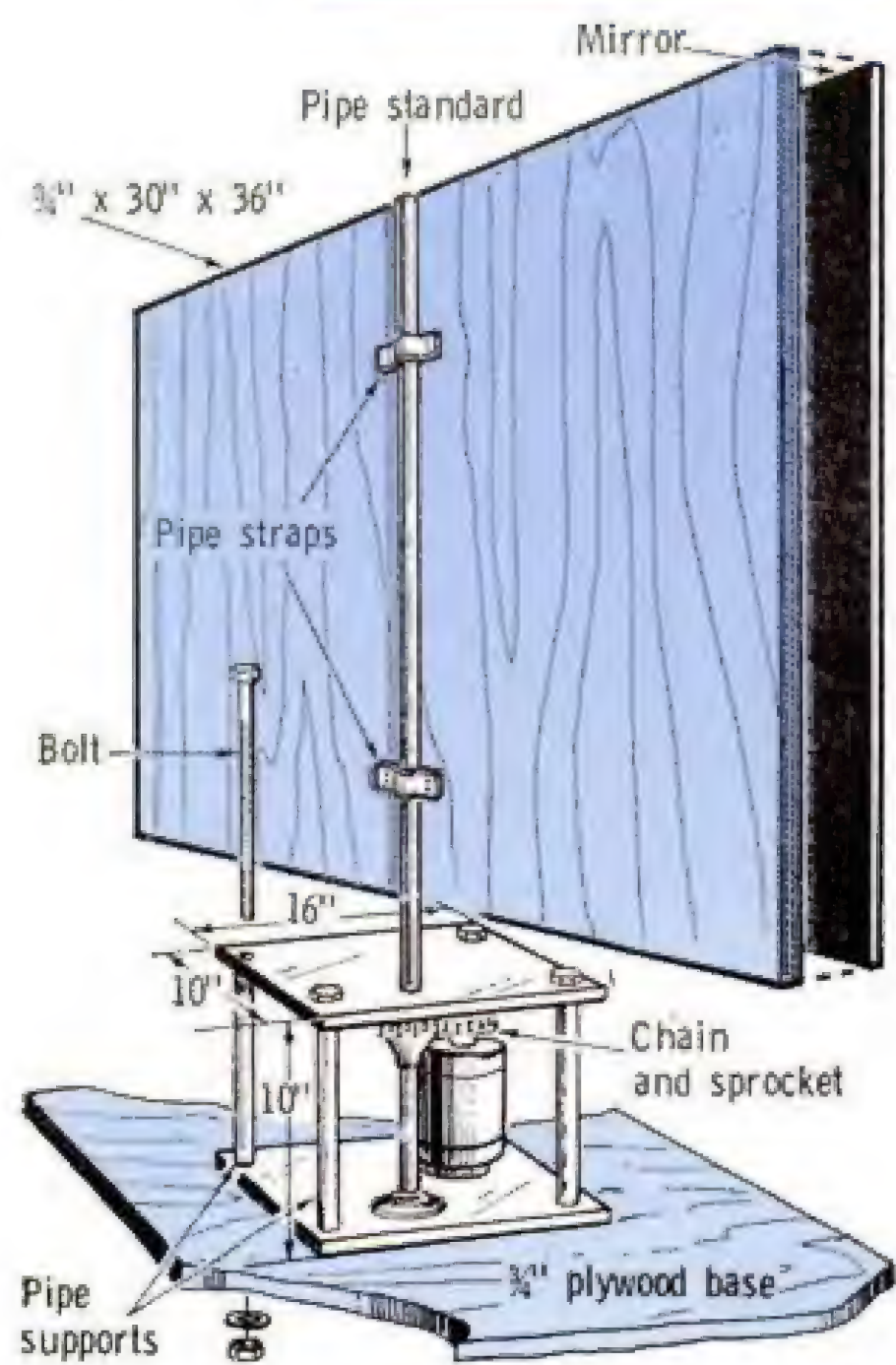
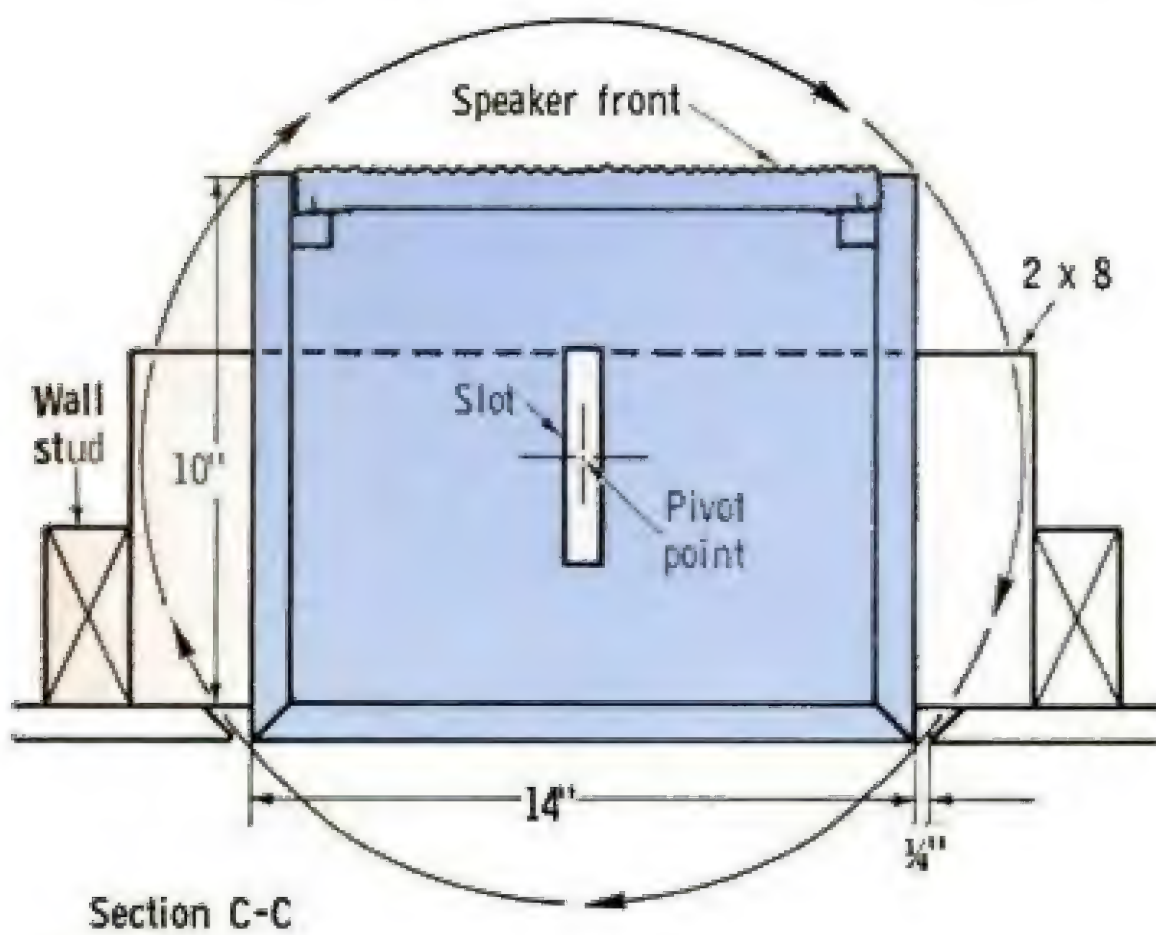
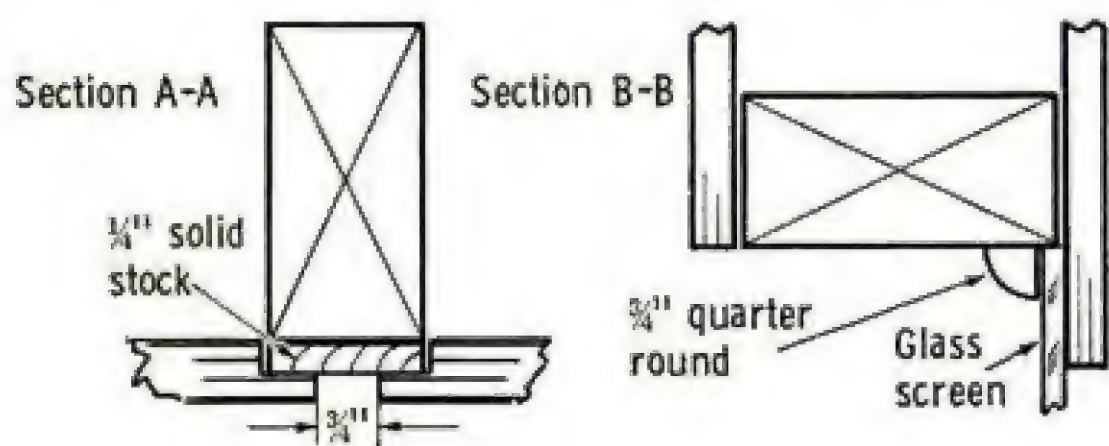
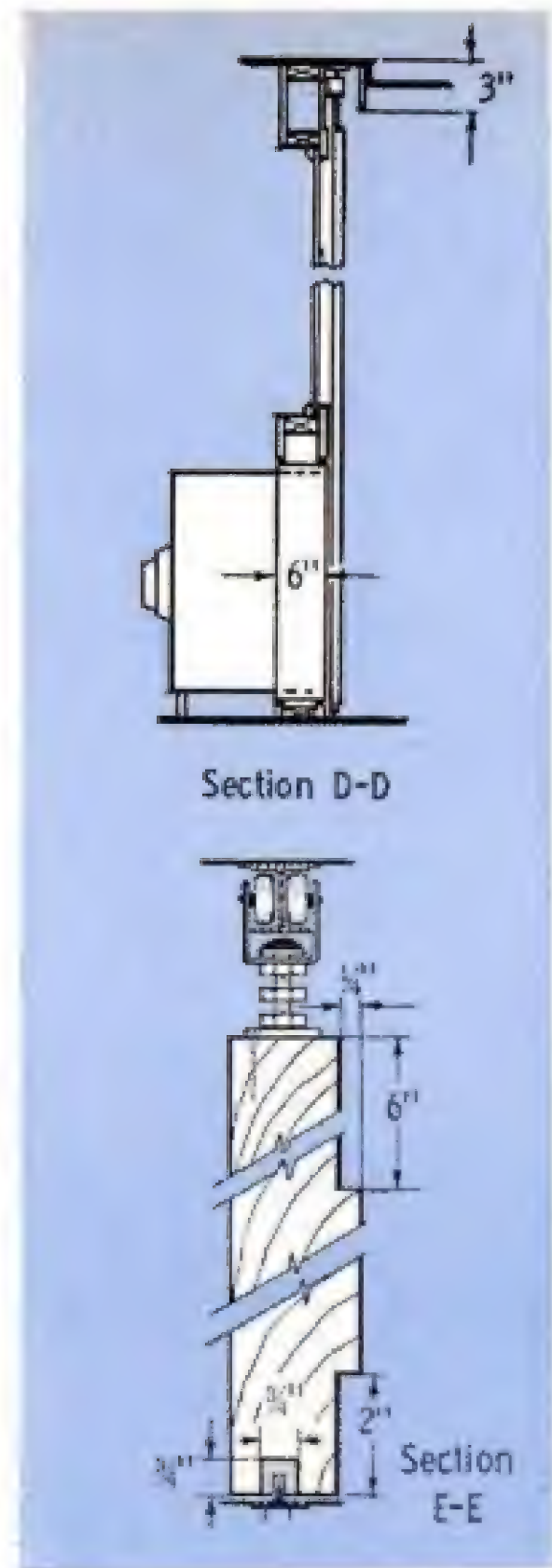
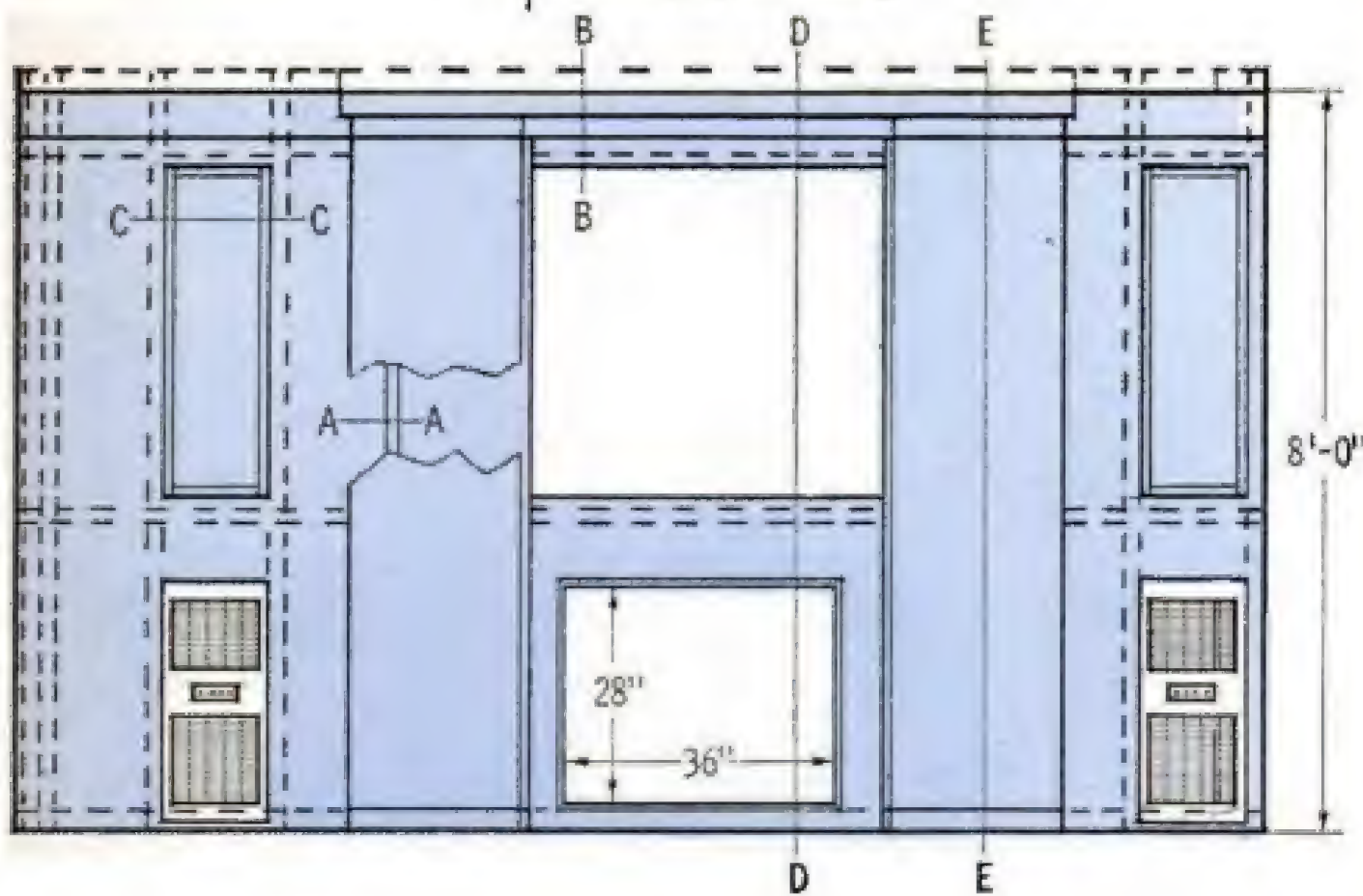
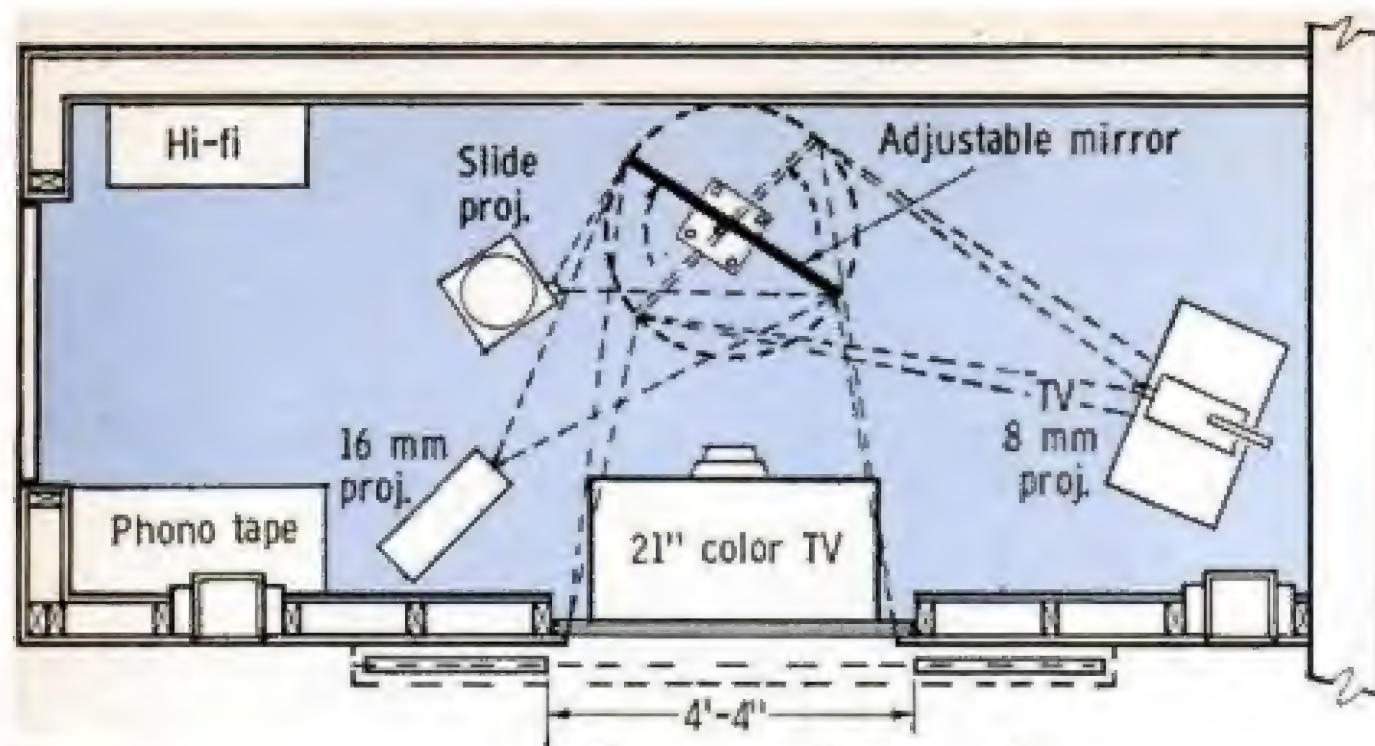
But how can four projectors—slide, 16mm sound, 8mm silent and black-and-white TV—share the same screen? The secret is a 30x36-in. revolving mirror which automatically turns to the proper angle for bouncing the beam from the chosen projector onto the screen—without distortion. This lets you position your projectors at opposite ends of the long, narrow room to achieve a full-screen picture. The distance each projector must be from



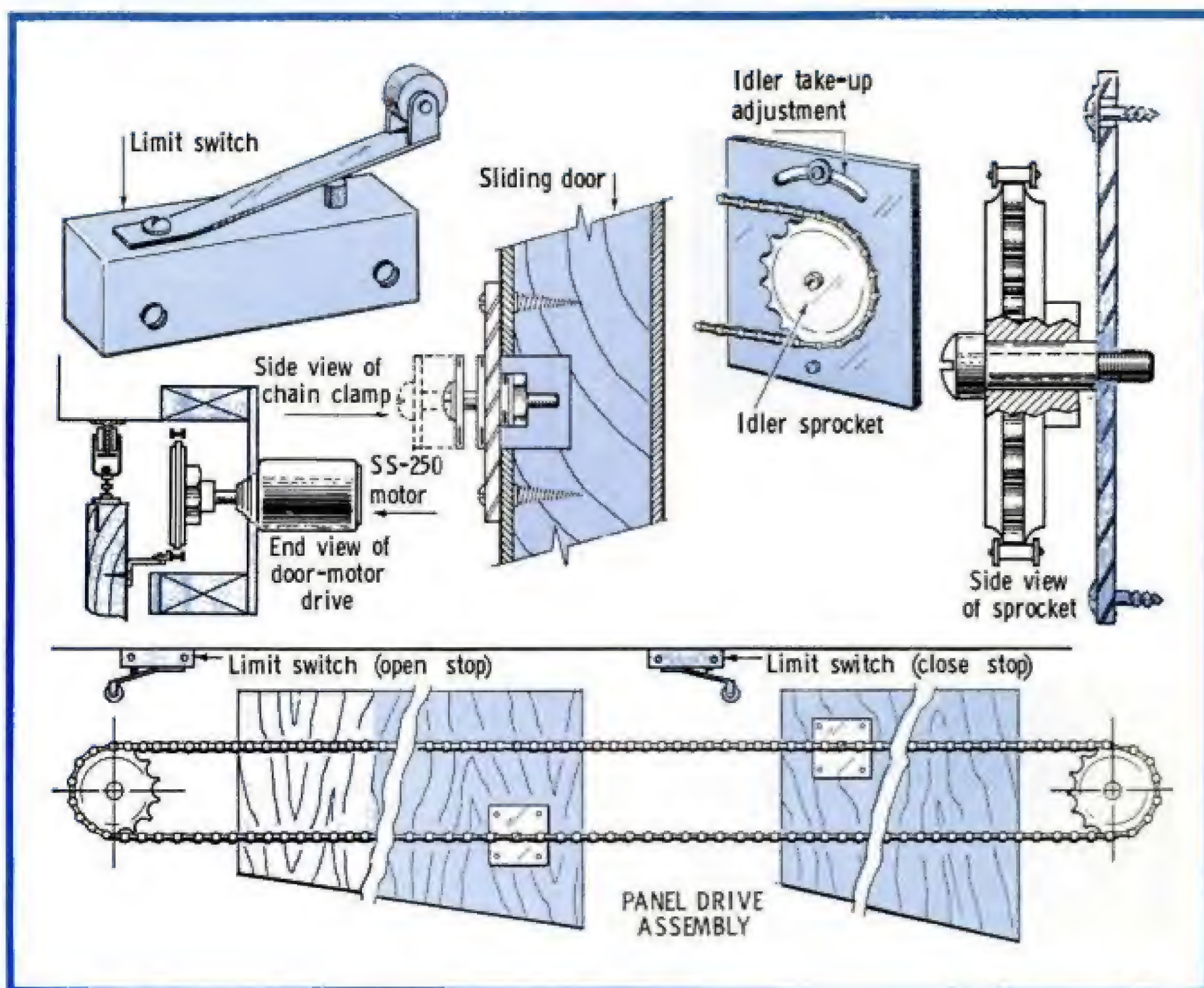
**PANELS THAT HIDE SCREEN** hang from hardware attached to top and tipped into overhead track. Inset shows drive motor mounted over screen inside closet











the mirror depends, of course, on the focal length of its lens. In figuring the total required "throw" for each projector, Baker included the four-foot distance between his mirror and screen.

Thus, the television projector—a \$2000 Saba import from Germany—had to be seven feet from the mirror to produce a total throw of 11 ft., while the Kodak Carousel slide projector was mounted only 20 in. from the mirror to achieve the same size picture.

Since each beam must strike the mirror at a specific angle to bounce an undistorted image that will fill the screen, the mirror is motorized to pivot until it faces the projector you've selected by push-button—at which point a limit switch cuts the power and a mechanical stop assures precise positioning. The mirror and the speakers are powered by separate motors—both Superior Electric's SS150. One SS-250 motor operates the sliding doors. These motors have a high torque rating, are instantly reversing, reliable and quiet. All units are connected to the remote-

*(Please turn to page 224)*



**DESPITE CHAOTIC LOOK**, projection "closet" is very efficient. Hi-fi and tape recorder are in foreground; mirror is turned, here, to TV and 8mm projectors



# CAULKING—a guide



**Puzzled about what to use where? Here's a short course in sealant selection which covers everything from silicones to Hypalon, plus a big reference chart that you can clip out, mount on heavy paper and post in your shop or garage**

By Merle E. Dowd

**T**HINK PERFORMANCE rather than price when shopping for sealants. Choose one that will last, and you'll probably end up saving money anyway. Even more important, you'll save the time and labor required to scratch out and replace old hardened caulking that no longer does the job. And during building or remodeling, remember that most bedded locations won't be accessible after construction, so you'll want a sealant that will remain flexible for the life of your house.

A wide variety of startling new materials is available for sealing exterior and interior building joints. As you might expect, some are specifically suited for certain jobs, while others, such as silicone rubber, can be used to solve a number of different problems. This is where cost should be considered. It doesn't make sense to use a high-cost sealant if a lower-cost material will do just as well. But don't use price as the only determining factor.

Incidentally, the chart doesn't include one- and two-part polysulfide sealants, because these were covered exhaustively in *Caulking That Lasts the Life of Your House* (March, 1964) and *Permanent Caulking for Your Boat Hull* (April, 1964). For special applications, particularly in boats, you might review the properties of these sealants in relation to

those described in the chart.

Only one-part sealants are included in the chart. They are packaged in metal squeeze tubes like toothpaste, in standard  $\frac{1}{10}$ - or  $\frac{1}{12}$ -gal. cartridges that fit into ordinary caulking guns, or in bulk containers for use in tube-type caulking guns. No mixing is required, since they cure by absorbing moisture from the air, exposure to air or by releasing solvent to the air.

Here's a rundown of the characteristics of each type. For further information, consult the chart.

**SILICONES.** Among the most useful and generally available one-part sealants are silicone rubber materials. Normally translucent, these sealants can be colored with pigments that don't migrate during curing. Three general types are available—*General Purpose*, for use around the house; *Construction*, used primarily in the construction trades for sealing wood, metal and concrete seams and joints; and *Marine*, for both above- and below-waterline use on boats. To assure the best adhesion, primers are required on certain materials.

Silicone rubber sealants cure by absorbing moisture from the air. Normally, the surface will skin over in 15 to 30 minutes, depending on air temperature and humidity. A full cure to an elastic



# to the new sealants

seal requires at least seven days. Cured silicone rubber is particularly resistant to soiling because little dirt will adhere to it. However, this property also prevents it from accepting any kind of paint after curing, so make sure that you finish painting before applying this type of sealant, and if you find it necessary to do additional painting, clean off any residue near joints that are to be painted.

Ordinarily, joints can be smoothed or trimmed with a damp finger, wood stick or other tool, but do this within a few minutes after squeezing the caulk into a seam before the surface begins to skin over.

Partially cured silicone sealants can be removed from joints or tools with xylene or toluene solvents. When fully cured, however, they must be carved off with a razor blade or other sharp tool.

Adhesion of silicone sealants is good—so good, in fact, that they can be used as adhesives, particularly where a watertight joint is required (though they are not recommended for use in concrete or tile-lined swimming pools). They are relatively expensive but, where small quantities are required and top performance is desired, there is little to compare with them.

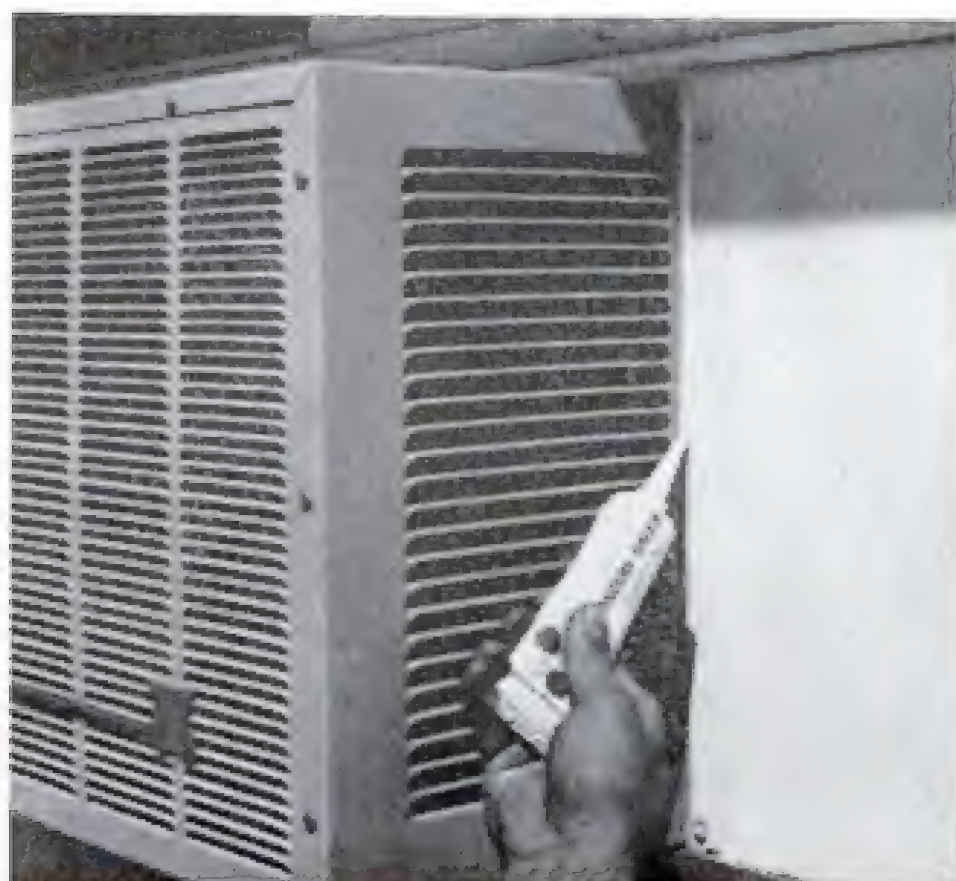
One precaution: Do not use silicones

on any kind of asphaltic material, oil impregnated wood or any other material that may bleed oil or solvents.

**BUTYL.** A step above regular filled, linseed-oil caulks (and slightly more expensive) are sealants based on butyl rubber. Butyl-rubber caulks skin over in the same way that oil-base caulks do—by releasing the solvents that keep the caulk pliable in cartridges. However, even the skin remains rubbery, stretching and compressing as the parts of the joint move. In general, butyl-rubber caulks can be expected to last from two to five times as long as oil-base caulking. When using butyl, though, remember that it has a relatively high shrinkage rate—up to 35 percent.

**HYPALON.** A DuPont synthetic, Hypalon is formulated into sealants primarily for construction use. It's easily colored, and special colors to match marble or other colored materials can be ordered in quantity for as little as 25 cents extra per gallon.

Hypalon-base sealants are among the most weather-resistant available, with almost complete resistance to ultraviolet radiation. (Hypalon-base coatings, for example, are used over thin-shell concrete roofs.) Since these are specialty sealants used mainly in construction, they are not



**SILICONE CAULK** absorbs vibration and allows for movement at joint between dissimilar materials, such as around this cutout for a window air conditioner



**TEMPERATURE VARIATIONS** don't affect silicone building caulk, so it's a good choice for jobs like sealing the joint between a dryer vent and the outside wall



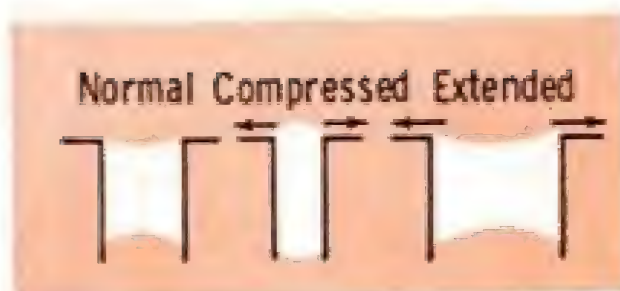
# aulks and Sealants for Home and Boat

USES	MATERIAL	MANUFACTURER	TRADE NAMES	COLORS	CLEAN-UP SOLVENT
Tub-tile joint sealant, adhesive for tiles & metal fixtures, metal joint (plumbing, gutters) sealant, rubber sealant, auto & boat sealant, canvas & leather repair	SILICONE Household & Auto	General Electric (1)	Bathtub Seal Clear Seal Auto Seal Metal Seal	White Translucent Black Aluminum	Clean cloth will remove sealant if used immediately or dampen cloth with mineral spirits, naphtha, toluol or xylol
		Dow Corning (Silastic) (2)	Bathtub Caulk Clear Sealer Metal Sealer Glass Caulk Aquarium Sealant	White Clear Gray Black Black	
Seals dissimilar materials, as between wood & stone or brick, seals joints between fiberglass panels, skylights, ventilators, metal & concrete. Beds and seals flashing. Sets windows in frames, seals asbestos-cement panels, copings and wood gutters	Construction	General Electric (1)	Construction Sealant	Translucent White Black Aluminum Neutral (stone)	Same as above
		Dow Corning (2)	Dow Corning 780 Building Sealant	White Clear Black Gray Natural stone	Same as above
Seals around windows, open siding or butt joints. Excellent for sealing flashings or for bonding loose shingles. Use to replace oil-base caulks or putty for up to 5 times expected life. Butyl sealants are useful in sealing dissimilar materials—glass, metal, plastics, wood, concrete	BUTYL RUBBER	Sonneborn Building Products, Inc. Sub. of De Soto Chemical Coatings (3)	Butakauk	White Gray	Mineral spirits
		Pittsburgh Plate Glass Co. (4)	Duribbon 4040 Non-Sag or Self-Leveling	Black Aluminum	Naphtha or a strong solution of Mr. Clean or Lestoil (1 to 1 mix with water). Clean up while sealant is fresh
		DAP, Inc. (5)	DAP Butyl-Flex	Gray Natural white	Mineral spirits
		Pecora Chemical (6) Corp.	BC-158 Butyl Rubber Sealant	White Brilliant white Gray Stone Black	Tan Aluminum Limestone Brown
		The Gibson-Homans Co. (7)	Eternaflex Butyl (skinning type) (nonskinning type)		Same as above
		The 3M Co. (8)	Weatherban 202 Butyl Sealant	Off-white Gray Aluminum	Same as above
General sealing and caulking in building construction at any location where oil-base caulks were formerly used. Hypalon†-base caulks are one-part sealants with almost unlimited weatherability and an unlimited choice of bright, fast colors.	HYPALON† (Chloro-sulfonated Polyethylene)	West Chester Chemical Co. (9)	Maintz Architectural Caulking Compound	Black Gray White Any special color @ 25¢/gal. extra	Xylene Tolunene
		Gates Engineering Co. (10)	GACO H-88	Gray	GACO N-450-1 (Xylene)
		The Gibson-Homans Co. (7)	Eternaflex One Component Hypalon† Sealant	White Gray Special colors	Xylol Toluol
Particularly useful in sealing metal joints, such as flanged sheet metal, gutters and mechanical parts. One-component sealant.	NEOPRENE†	Gates Engineering Co. (10)	GACO N-99 Neoprene Sealing Compound	Off-white	GACO N-450-1 (Xylene)
Glazing, general construction sealant. Applies directly from cartridges. Particularly adapted to narrow cracks. Combines the elasticity of Neoprene† with excellent weather resistance of Hypalon.†	NEOPRENE†-HYPALON† Combination †TM—E. I. duPont de Nemours & Co.	Tufcrete Co. (11)	Tufcrete Elastomeric Sealant	White Gray	Xylol Toluol
Interior sealing of joints around tub and shower, fills cracks in tile, plaster, glass and plastic, sink, counter tops. Fills nail holes and seals window joints around windows and storm sash	LATEX	The Cambridge Tile Mfg. Co. (12)	Cam Calk	White	Water
		The Borden Chemical Co. (13)	Mystik Tub Caulk	White	Water
(Same as above)	LATEX (Polyvinyl Acetate Copolymer Latex)	DAP, Inc. (5)	Kwik-Seal	White	Water



PRIMER	CURE METHOD	CURED HARDNESS*	SHRINKAGE	ADHESION	PACKAGE SIZES AND COSTS
None	Absorbs moisture from air Non-tacky—1 hour Full cure—10 days	25-30	Nil	Good	3-oz. tubes @ \$1.95 1-oz. tubes @ 98¢ Both sizes in 4 colors
None	Reacts with moisture vapor from air Non-tacky—1 hour Full cure—24 hours Max. properties—7 days	25	Nil	Good	3 oz. @ \$1.95 Bathub 5 oz. @ \$2.95 Caulk 6 oz. @ \$3.25 only 3 oz. @ \$1.95 All others
G.E. Metal Primer for aluminum, bronze, copper, stainless & galvanized steel. G.E. Masonry Primer for concrete, stone, unglazed tile & acrylic plastic	Same as above	35	1-3%	Good	1/12-gal. cartridges } Sold to @ about } construction \$4.95 } trade 5-gal. bulk containers
Dow Corning Surface Conditioner A is required on all surfaces except acrylics, which require Surface Conditioner C	Same as above	25	Nil	Good to excellent, depending on base material	1/12-gal. cartridges 4.5-gal. bulk containers
None for most surfaces. Use Kure-N-Seal as primer on highly porous or dusting surfaces. Use rust preventive primer on steel	Solvent release	25-35	5-10%	Good	11-fl-oz. cartridge @ \$1.80 1-gal. & 5-gal. bulk containers
None	Solvent release	0-10	Approx. 30%	Good	1/10-gal. cartridges Qt., gal., 5-gal. & 55-gal. bulk containers
None	Air dry	10-15	10-15%	Good	11-fl-oz. cartridge @ \$1.80 Various bulk sizes
None	Solvent release		5-10%	Good	1/10-gal. cartridges & bulk containers
None	Solvent release	0	15-20%	Good	
None	Solvent release		15-20%	Good	1/10-gal. cartridges 5-gal. pails
None	Solvent release	20	3-10%	Excellent	1/10-gal. cartridges @ \$1.75 Gal. @ \$14.35
None	Solvent release	25-30	10%	Excellent	1/10-gal. cartridges @ \$1.85
None	Solvent release	25	14%	Excellent	1/10-gal. cartridges 1- & 5-gal. bulk containers
None	Solvent release & internal cure	10	5-8%	Excellent	1/10-gal. cartridges @ \$2.25 Bulk containers
None	Solvent release & internal cure	20	15%	Excellent	1/10-gal. cartridges 1, 5, 30 and 55-gal. bulk containers
None	Solvent release & air reaction		5-10%	Good	6¾-oz. aerosol cans @ \$1.49
None	Solvent release & air reaction		5-10%	Good	4-oz. tube @ 79¢
None	Solvent release and air reaction	40-50	5-10%	Excellent	6-oz. tube @ \$1.19





**MOVING JOINTS** should be caulked with slight dip in normal position—not tooled flush. Seal shouldn't be much deeper than it is wide, and bottom should be free to move as flexible sealant stretches or contracts

generally available through local hardware stores, though most large building supply dealers carry them.

Hypalon cures slowly by releasing solvents and is easily damaged until fully cured. It's not recommended for sealing joints in walkways where women's sharp heels may penetrate.

**NEOPRENE.** Another of DuPont's synthetic rubbers, Neoprene offers exceptional elasticity and softness when cured. Such properties make it ideal for sealing small seams and sheet-metal duct work.

Neoprene sealants cure very slowly, taking up to 60 days for a full cure. In the meantime, they can be damaged easily. Neoprene is often mixed with Hypalon to form an elastomeric sealant which combines the excellent weathering properties and color of Hypalon with the elasticity and adhesion of Neoprene. Combination Hypalon-Neoprene sealants are often used for sealing soft stone to prevent tough sealants from pulling loose a surface layer of the stone.

**LATEX.** Formulated somewhat like rubber-base paints, latex caulks are easy to use and relatively inexpensive. Some brands are packaged in aerosol containers; others are sold in small tubes.

Latex caulks are designed primarily for interior sealing around bathtubs, showers and sinks. They remain flexible, and unlike oil-base caulks, will not crack, chalk or crumble. Because plain water can be used as a solvent, trimming and clean-up are easy.

**MISCELLANEOUS.** A surprising number of other materials are available for caulking and sealing. Rubber, asphalt, nitrile rubber and certain plastic polymers are formulated for application with a caulking gun. These plastics usually cure to a flexible sealant by releasing

*(Please turn to page 240)*



**FOR LARGE JOBS,** you can buy silicone construction sealant in standard cartridges. Once cured, it remains flexible from  $-40^{\circ}$  F. to above  $250^{\circ}$  F. making it ideal material for sealing joints in metal heating duct

## USES

Tub-tile joint sealant, adhesive for tiles & metal fixtures, metal joint (plumbing, gutters) sealant, rubber sealant, auto & boat sealant, canvas & leather repair

Seals dissimilar materials, as between wood & stone or brick, seals joints between fiberglass panels, skylights, ventilators, metal & concrete. Beds and seals flashing. Sets windows in frames, seals asbestos-cement panels, copings and wood gutters

Seals around windows, open siding or butt joints. Excellent for sealing flashings or for bonding loose shingles. Use to replace oil-base caulks or putty for up to 5 times expected life. Butyl sealants are useful in sealing dissimilar materials—glass, metal, plastics, wood, concrete

General sealing and caulking in building construction at any location where oil-base caulks were formerly used. Hypalon-base caulks are one-part sealants with almost unlimited weatherability and an unlimited choice of bright, fast colors.

Particularly useful in sealing metal joints, such as flanged sheet metal, gutters and mechanical parts. One-component sealant.

Glazing, general construction sealant. Applies directly from cartridges. Particularly adapted to narrow cracks. Combines the elasticity of Neoprene† with excellent weather resistance of Hypalon.†

Interior sealing of joints around tub and shower, fills cracks in tile, plaster, glass and plastic, sink, counter tops. Fills nail holes and seals window joints around windows and storm sash

(Same as above)



#### REMARKS

Readily available in hardware and department stores. If color is not important, use translucent silicone sealant. All are highly versatile household silicone sealants; not recommended in sidewalk joints or with porcelain steel. Flexibility of cured silicone rubber allows stretch of joints up to 3 times normal width or compression to  $\frac{1}{2}$  width. Silicone sealants extrude easily

Silicone construction sealants remain flexible for life after curing; thus can stretch or compress as building or joints move with settling or temperature changes. Silicones will stick to painted surfaces, but paint will not adhere to cured silicone. If bonded to paint, joint may fail if paint bond fails. Best joint bonding is directly between silicone sealant and base material. Best joint dimension is  $\frac{1}{4}$  x  $\frac{1}{4}$  to  $\frac{3}{4}$  x  $\frac{3}{8}$ ". Fill deep joints with polyethylene foam. Tool or trim joints within 10-15 minutes and remove any masking tape before joint surface begins to develop skin. Do not use construction sealants in joints continuously under water

Butyl rubber base caulks are somewhat less resilient than cured silicone or polysulfide rubber but offer considerable improvement over oil-base caulks for general house & building construction. Butyl rubber caulks allow for joint movement and do not become brittle with age. Butyl particularly useful for thin beading or needlepoint caulking

Use the self-leveling type only for horizontal seams. Shrinkage greater for self-leveling type than for nonsag. Seal is effective immediately and remains flexible while solvent escapes

Butyl caulk may be painted over after skin is formed and seal is set—up to 7 days, depending on weather. Apply only when temperatures are above 40° F.

Use nonskinning (uncuring) type where sealer will not be exposed to outdoor elements. Limit joint width to  $\frac{3}{8}$ " max.

Butyl sealant adapted to fabrication joints where total movement is limited. Can be used as a backup sealer for large seams and for caulking applications where high resiliency and quick recovery are not critical requirements.

Hypalon<sup>®</sup>-base caulking compounds are the most easily colored, and special colors are easily obtainable. Ultra-violet radiation resistance is excellent, and cured seals remain rubbery and resilient for an almost unlimited time. Adhesion is excellent. Curing time is up to 60 days, depending on weather; therefore, do not stress joints during the first 1 or 2 months, even though surface appears skinned over solidly. Can be painted over after joints are cured. To assure best adhesion, press bead of caulking to surface for full contact. Apply only when temperatures are 50° F. or higher; otherwise, warm caulking to 70° F. in heated area

Cures very slowly—up to several months required for complete cure. Remains permanently elastic. Not adapted for continuous immersion in fresh or salt water

Cures slowly—50-120 days after application although dry to touch after 24-48 hours. Only fair resistance to oil. Can be painted when surface loses tack

Easy caulks to use because they are water-thinned during application. Seams can be trimmed and smoothed with moist finger or damp tool. Later material develops water resistance when dry. Latex caulks can be sanded and painted. Less resilient and elastic when cured than synthetic rubber materials. Material washes easily from tools and hands for easy clean-up with plain water

Easy caulk to use because of its soft buttery consistency. Seams can be trimmed and smoothed with moist finger or damp tool. Caulk develops water resistance when dry. Latex caulks can be sanded and painted but are less resilient and elastic when cured than synthetic rubber materials. Latex caulk washes easily from tools and hands with water





**BRUSHED EFFECT** on brass can be produced with wire brush chucked in grinder. Movement controls pattern



**TO WRITE ON GLASS**, use tiny abrasive wheel. Larger wheels are better for rounding sharp glass edges



**YOU CAN EVEN ERASE** with a small hand grinder, such as a Handee, provided you keep the touch light

***More than its name implies, this high-speed handful of rotary power packs a bagful of tricks to make it the most versatile tool you can own***

By Walter E. Burton

**I**F YOU THINK of a hand grinder as a bantamweight tool fit only for model-making and light hobby work, better take another look. This mighty mite is a tough little package of high-speed cutting power.

Yet in spite of the fact that it's an extremely versatile workshop tool, the hand grinder is usually underestimated and unappreciated. Workshoppers who haven't seen one in action are misled by its somewhat delicate, dental-lab appearance, which is unfortunate, because the hand grinder can drill, carve, grind, sand, buff and engrave like no other tool.

Hand grinders come in sizes ranging from comparative featherweights to "industrial" types weighing several pounds. Regardless of the size, the heart of each one is a high-speed electric motor (24,000-27,000 rpm) shaped to fit your hand and equipped with a chuck. Accessories which can be chucked into a hand grinder include drill bits, abrasive wheels, rotary



**WITH EMERY WHEEL** dressed to the correct size, hand grinder is fine for sharpening thread-cutting taps



# **-the hand grinder**



**WITH SANDING DRUM** chucked in grinder, you can smooth curved edges and handle other free-hand sanding rasps and files, sanding drums and discs, brushes, polishing wheels and pads, mid-gut circular saws and abrasive cut-off wheels. How's that for versatility!

Actually, the motor unit isn't always hand-held when in use. Drill-press mounts

are available in which the motor unit can be clamped to a column chuck-end down so as to form the drill-press head. In one type, the table can be moved up and down; in another, it's the motor that moves to feed the bit into the work. Such an ar-



**DELICATE AND PRECISE** grinding, such as a gunsmith often requires, is a specialty of the hand grinder

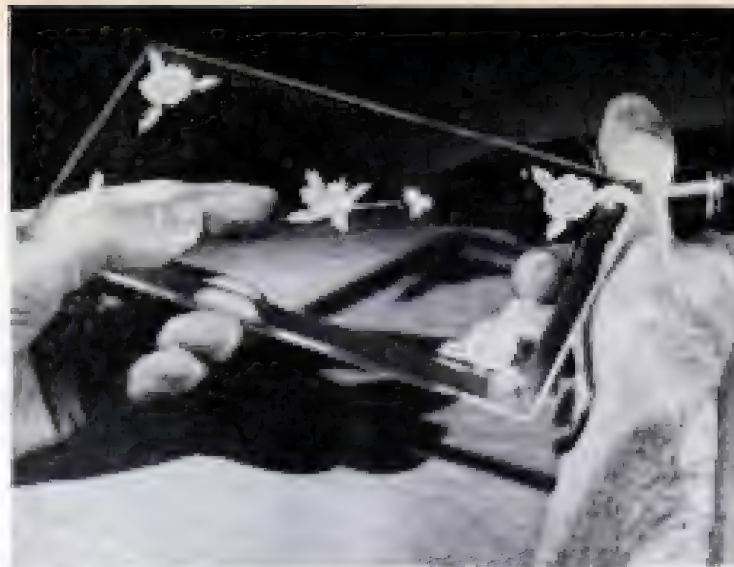


**REMOVING RUST** from golf clubs, tools and other metal surfaces is easily accomplished with wire brush





**GRINDING OFF RIVET** heads is a shop job that goes fast when it's done with hand grinder such as Sears Craftsman model

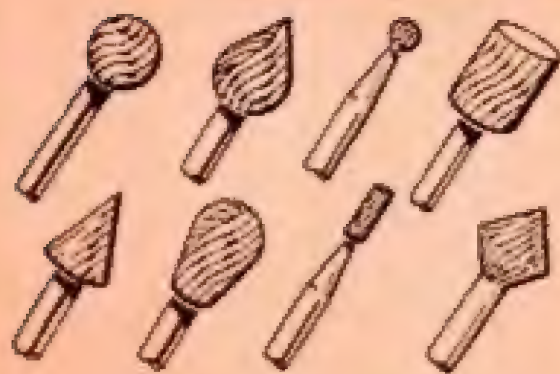


**SPECIAL TINY DRILLS** and burs (rotary files) let you make delicate incise cuts in the underside of clear plastic stock



**MOWER BLADE** can be sharpened right on the mower with a conical abrasive wheel

### Hand-grinder accessories



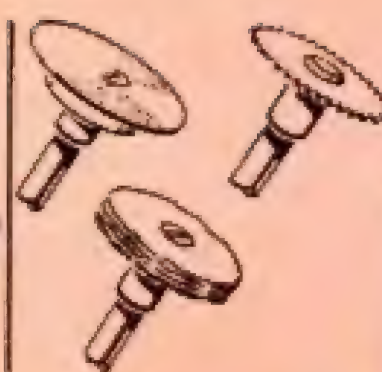
Steel cutters



Wire brushes



Grinding wheels



Sanders, saws and bits

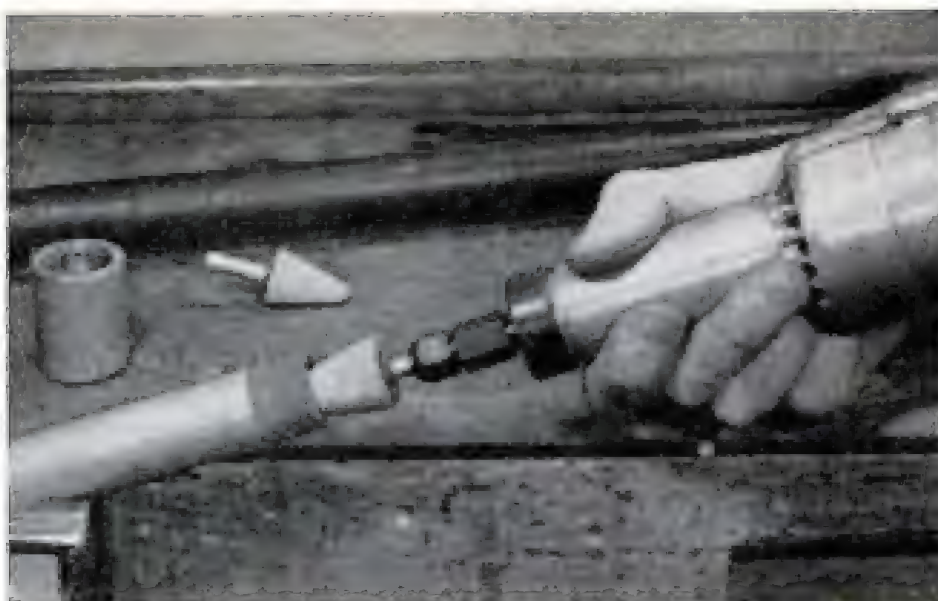


**RELIEF CARVING** and engraving is surprisingly simple with the wide variety of bit shapes available

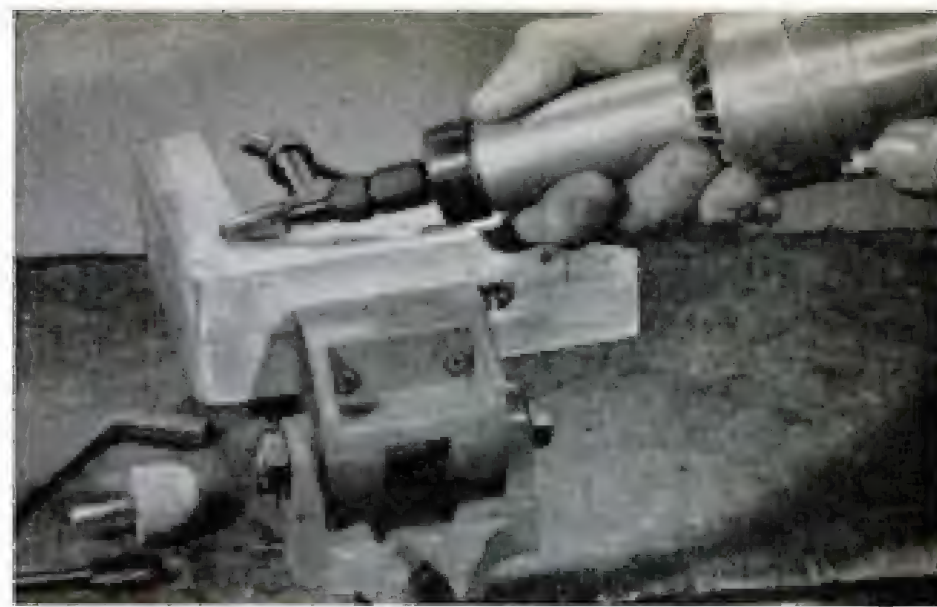


**ROUTER ATTACHMENT** on Dremel Moto-Tool is being used here to cut straight half-round grooves in wood

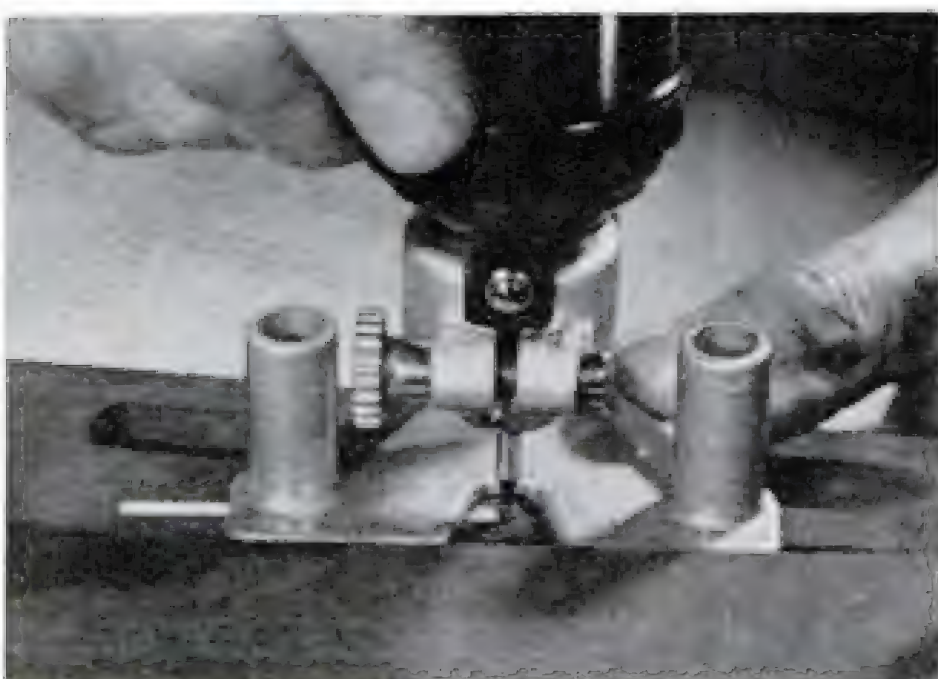




**SMOOTHING INSIDE** edges of pipe is only one of the many jobs you can do with a conical abrasive wheel



**TREE-SHAPED FILE** smooths a welded joint on aluminum angle bracket. A similar file shows in foreground



**MACHINE PARTS** can be made or repaired with a hand grinder. Here, a hardened pin is being shortened

range is handy for delicate work involving very small bits (No. 80 twist drills, for instance).

The typical hand-motor unit has a chuck for handling two or three sizes of collets. Small geared-type chucks for holding a wide variety of shank sizes may be available as extras.

Bench stands which hold the grinder in various fixed positions can be obtained for most units. These leave both hands free to hold and guide the work.

Another useful accessory is a clamp-on adjustable table that converts the motor into a fixed or portable router. Still another is a mount for attaching the motor unit to a lathe toolpost so that it can be used for internal and external grinding of work in the lathe chuck or between centers.

Although the chief merit of hand grinders is their high speed, you can obtain speed-reducing units for use where reduced rpm seems desirable, as in some drilling applications. However, in such work you have to be careful not to overload the under-energized motor by applying too much pressure to the tool.

*(Please turn to page 220)*



**CARVING WOOD** and other relatively soft materials is a job that hand grinders do especially well



**BENCH STAND** converts a hand grinder into a dandy little drillpress for accurate vertical drilling. Here the grinder remains stationary while the table of the stand moves up and down by turning a handwheel

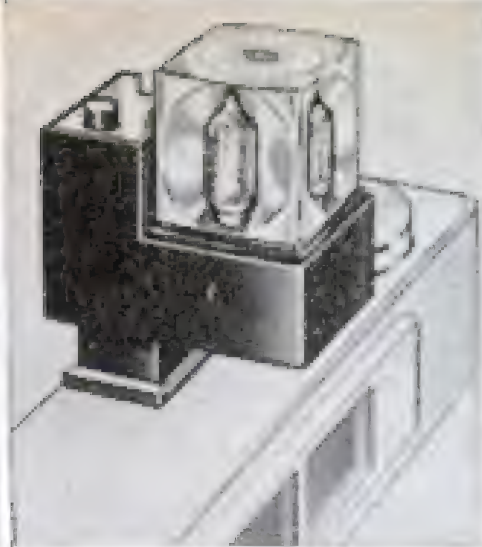




Kalimar Kent adapter



Kalimar BC gun



Soligor gun



Soligor adapter

## Hitch any camera to a flashcube —if you can find one

Flashcubes have arrived—in acceptance if not at dealers. Many more cameras have appeared, following the Kodak Instamatics, that handle the four-in-one flashers. What's more, a plethora of adapters and flashcube guns for standard cameras have extended their use greatly.

What this has done, however, is to make it difficult for Instamatic camera owners to shoot flash. Flashcubes are just not easily found, particularly in metropolitan areas. Until the supply catches up, which should be sometime this fall, there are rays of sunshine for Instamatic owners—a couple of adapters that look like flashcubes and take four AG bulbs.

The Kalimar Kent FC/AG Flash Unit is one. It accepts AG-1, 1B or 3B bulbs. The adapter is automatically rotated by the camera and has a built-in bulb ejector. It costs \$3.95. A similar one is the Turret Flash adapter.

On the other side of the coin, there are adapters for those who like flashcube convenience or like its utility for short-range, rapid-sequence shooting, but don't own Instamatics.

Seeing the handwriting on the wall in short order, Agfa-Gevaert has introduced a \$1.25 adapter for its Isoflash-rapid cameras. It snaps into the camera's live bulb socket. It will accept flashcubes or AG bulbs, but they must be rotated manually, certainly a loss in function.

Kalimar also puts out a gun, more typical of the crop of non-Instamatic cube

holders that follow. The PM Autocube BC Flash Gun mounts in any camera's accessory shoe and hooks up with a PC cord. A cube inserted in the gun is rotated one full turn, which then permits automatic rotation after each exposure, controlled by a circuit within the gun. After the fourth flash, the cube rotates only 45°. With a 15-v. battery, it's \$6.50.

Kodak's Rotocube Flashholder is similar in some respects. It provides windup automatic firing; its final rotation is 45°, and it has a PC cord. In addition, the Rotocube provides flash sync with a live camera shoe and carries an exposure calculator. The tab is under \$22 with batteries. Kodak's other version is the Flashcube Holder, Model 1. It's a shoe-mounted, center-contact gun that must be rotated manually. Provision is made for accepting a PC cord. The holder has an exposure-guide table and comes with batteries for under \$6.

General Aniline & Film Corp. has two Ansco entries. The Anscolite III plugs



Agfa adapter



Anscolite III



# PICTURE THIS

By Leonard Samuels



Kodak Model 1



Kodak Rotocube

into Ansco Cadet 127 cameras and offers automatic rotation and a cube ejector. It's \$3.50 without batteries. The Anscolite IV at \$5.75, without batteries but with leatherette case, is a BC unit for cameras with PC jacks. The cube is manually advanced by a lever stroke and has an exposure calculator.

Yashica's gun is also a BC unit that mates with a PC jack. It has an ejector and a knurled wheel for advancing the flashcube, with click stops to align it. It's priced at less than \$5.

Allied Impex's Soligor Cubematic flashgun is designed for hot-shoe or PC operation and features an automatic spring-action ejector and an exposure dial. One convenience not found on the other adapters is a neon test lamp. With case, it sells for \$6.95. For someone just nuts about flashcubes, there's the Soligor adapter. This \$2.95 manually operated unit is designed to plug into a standard flashgun that handles No. 5 bulbs. It has a spring-action ejector.—*Len Samuels*



Anscolite IV



Yashica gun

Complex simplicity might be one way to peg the photographic field today. Cameras seem to be reaching the state of cake mixes: First, everything is being automated for you so that technical competence is no longer required to be an expert with fine, expensive cameras.

Second, I expect some manufacturers will continue to leave some element of camera manipulation in primitive form, despite an automation capability for it, just so the user does not feel completely robbed of his photographic skill—a la the Ernst Dichter school of consumer psychology.

On the cameras selling for \$200 and up, of course, manual overrides are provided for camera artists and to accommodate human interpretation, such as for moving objects and depth of field.

Nevertheless, this box-camera simplicity will result in more high fidelity cameras reaching your hands and make experts of all of you. What turns the trick, for the most part, is compact electronic circuitry. More and more cameras include transistorized circuits that compute optimum speed and aperture. Even flash settings are automatically adjusted according to range. Most cameras with photoelectric aperture control provide warnings for under- or over-exposure.

What makes picture control near perfect are single-lens reflex viewing and the use of behind-the-lens exposure meters with narrow acceptance angles. With this arrangement, even filter factoring is accounted for automatically. Anyone for still-camera electronic zoom focusing?

**Super 8** is now the generally accepted format for movie film, and another version has come along called Single 8 (page 19, June '66 PM). The difference is in the strong polyester film base and the cartridge, which is thin, reversible and continuous running.

But with this larger format, most of the industry is pitching its sales in movie projectors to the coming generation of amateur movie-makers, ignoring the 30-odd years of regular 8-mm users. Three or four manufacturers have provided for both markets with dual-function projectors. At least one of them will even handle the two types spliced together.



# Chasing Down

BY MORTON J. SCHULTZ

Here are techniques the pros  
those squeaks, squeals and

**M**OST SATURDAY MECHANICS take Sundays off. But not Ned Ames, my neighbor. His Sundays are devoted to cleaning, polishing and otherwise pampering his beloved chariot. A departure from Ned's sabbath ritual a few

Sundays ago made me curious. Instead of sweeping, washing and buffing, Ned was leaning down into the engine, tapping and tinkering.

"It's developed a rattle and I just don't know where it's coming from," he moaned.



**SOURCE OF MANY BODY RATTLES** will be revealed by bouncing a rubber mallet along the sides of the car



# Chassis Noise

## use for locating and silencing rattles that afflict your car

Ned's is probably the most common complaint of all car owners, because a guy who can't tell a sparkplug from a radiator cap can tell when he's carrying a squeak or rattle for a passenger (and I have a fistful of letters from *Auto Clinic* readers to prove it).

The main problem in silencing a noise in any car is to find the source of the racket. Once you've found it, the bolt-tightening, reconnecting or replacing of a part is usually a cut-and-dried procedure.

So the primary question is: How do you find the origin of a noise? I put this question to Jim DiMura of DiMura's Auto Rebuilders, Middlesex, N.J. An expert body-repair man, Jim's diagnoses and repair techniques are summarized in the following paragraphs.

**Today's cars** have more opportunities to develop shakes, rattles and groans than their predecessors. Why? Well, consider some of their design features: more powerful engines; low-slung styling requiring a more severe driveline angle; lots of chrome; and additional under-the-hood optionals such as power steering and air-conditioning units—all of which are subject to loosening, hence rattling.

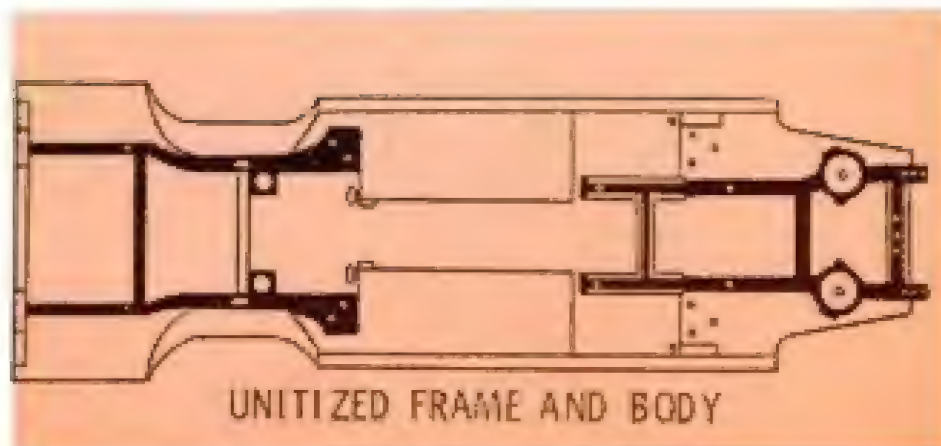
You will have a better understanding of automotive noise sources if you know which of the three basic body designs is used in your car—*nonunitized*, *unitized* or *semiunitized*.

A nonunitized body is attached to the frame by means of bolts. This type can develop body noise when one or more of these bolts work loose.

A unitized body is welded directly to the frame. No bolts are used, so there is less chance of body noise. However, body noise can develop if one of the spot welds should part.

A semiunitized body has some of its sections welded to the frame, some bolted to it. Thus bolts and spot welds can be sources of noise in this type of construction.

Take a look under your own car to de-



**UNITIZED BODY** is spot-welded to the frame so that frame and body appear as a single unit. Rattles can develop in this construction when spot welds part



**NONUNITIZED BODY** is fastened to frame by means of bolts which pass through rubber spacers. Rattles develop in this construction when body bolts loosen





**BODY BOLTS** on nonunitized car should be tightened to specification periodically with a torque wrench

termine which type of body it has. A non-unitized body is easily identified by the bolts that secure it to the frame. The underside of a unitized body will appear as a one-piece box rather than as a conventional frame. The front of a semiunitized body is usually welded to the frame, while the rest of it is bolted to the frame.

A road test is often the first step in tracking down a hard-to-find noise. By running the car over various types of road surfaces, a rattle or squeak is usually amplified thus it helps pinpoint its source.

Also, certain types of noises will develop only at a particular speed or under a specific engine load. Determining the driving conditions which produce or intensify a noise provides a starting point for tracing the trouble.

Generally speaking, there are two main classifications of car noises:

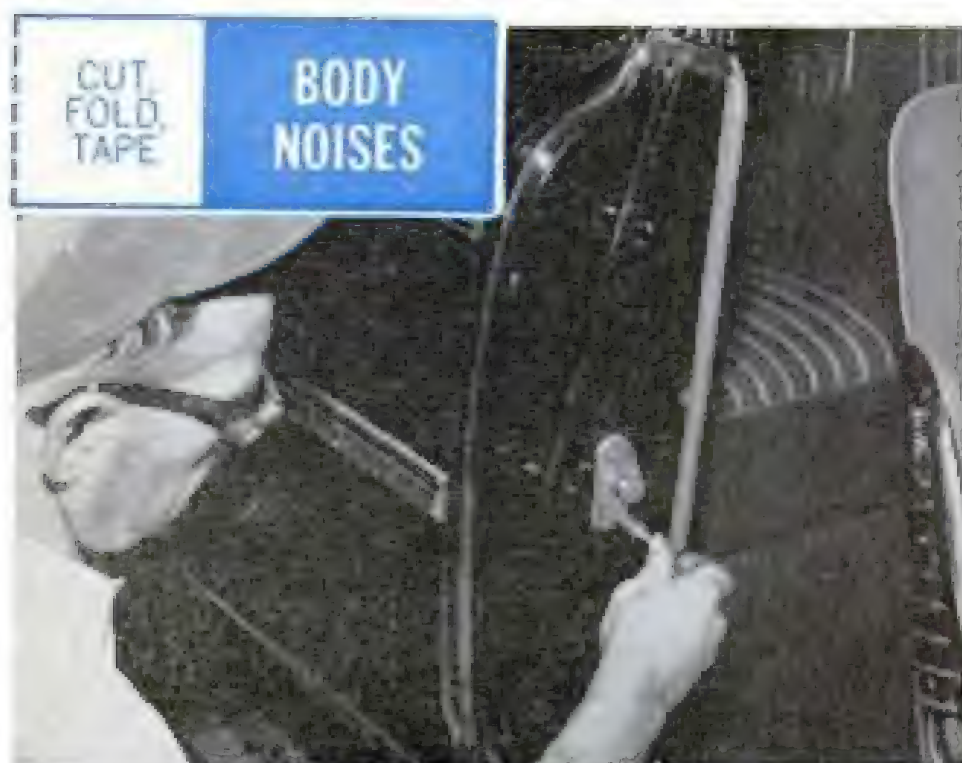
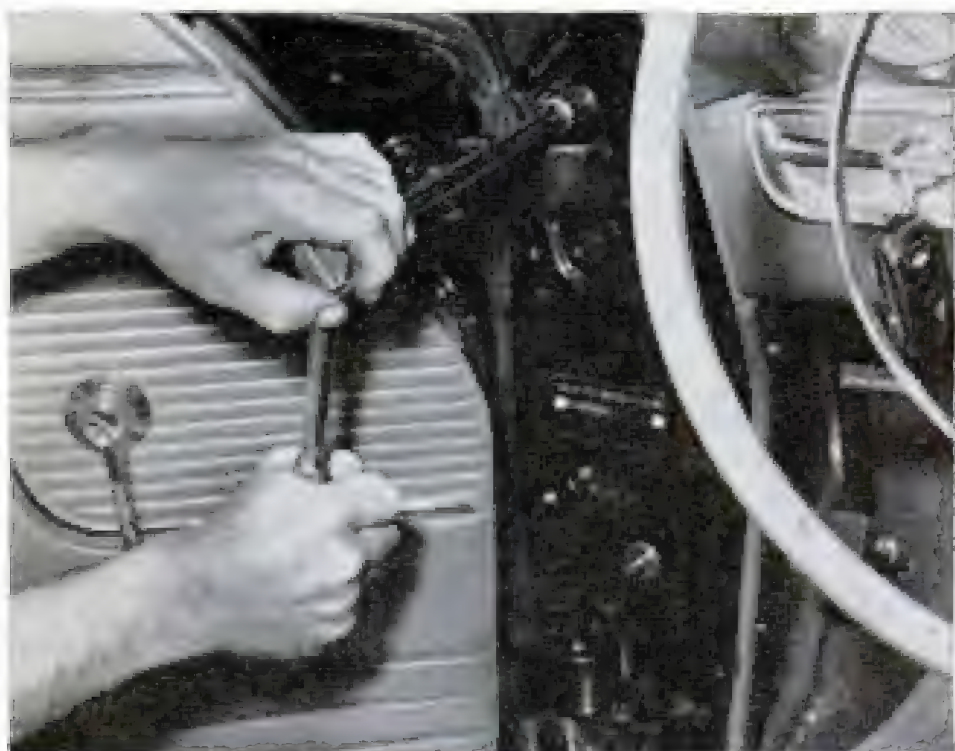
- Those which are produced by the body structure.

- Those which originate in the chassis.

Most body noises are caused by a loose part, an improper mounting, a broken spot weld or by road wind. Let's examine some of the more common culprits in the car-noise family.

**Loose parts.** Needless to say, all cars—including those with unitized bodies—are stuck together with more than a hatful of bolts, each bolt a potential noise-maker.

Some cars come off the assembly line



**TO REALIGN A RATTLING DOOR**, first loosen hinge bolt (top, left), then use a pry bar to reposition door (top, right) and retighten bolt. Next remove striker plate, (bottom, left) and shim plate as required (bottom, right) to assure door will lock firmly. Finally, take car out for road test and check success of repair



with built-in rattles. More often than any car maker will admit, nuts, bolts, screws and other miscellaneous hardware are inadvertently left in the bottoms of doors and window wells.

A rubber mallet is the best tool to use to locate a noise caused by a loose part. Start at one end of the car and gently strike each area, especially along the underside. When you hear a rattle, check the immediate area for loose nuts and bolts, and tighten 'em.

A rattle detected inside a door well means that the trim panel will have to come off to give you access to the loose part lying in the well.

If a loose body bolt is found to be the cause of a rattle, tighten it, but be sure to torque it to specification—usually 20 to 30 ft. lbs. (check your owner's manual).

**Windows.** The two main causes of window vibration and noise are worn window regulators and loose or worn weatherstripping in the channels.

To check the condition of the regulators, rap the surface of each trim panel with the rubber mallet. If this sets up a rattle, chances are the window-regulator rivets or bushings are worn. Probably one or more parts of the regulator will have to be replaced.

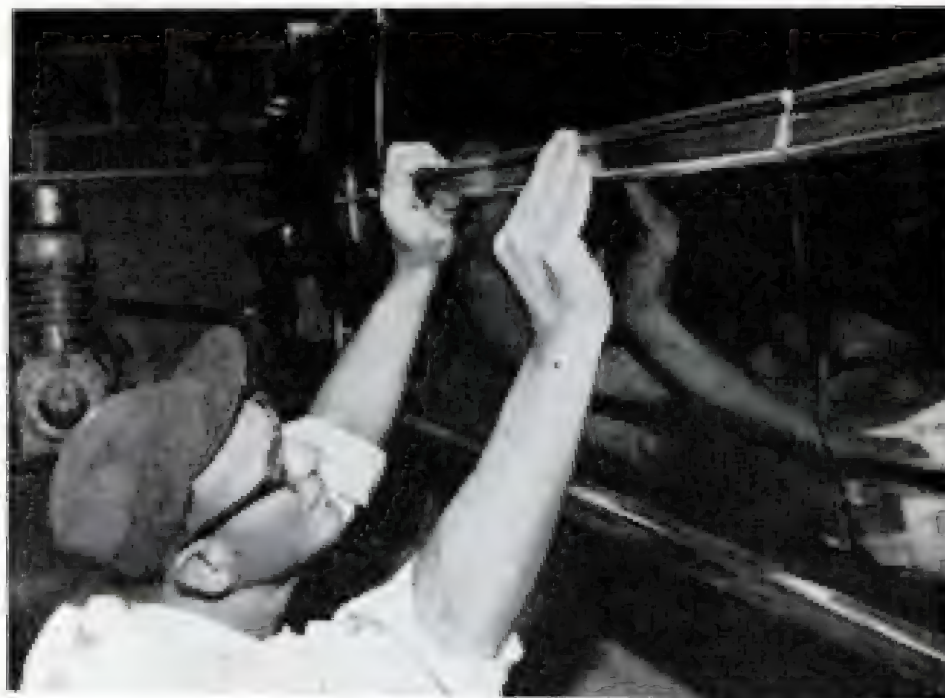
To refasten loose weatherstripping around windows, first pull it out altogether, then wash its back surface, and the channel surface to which it adheres, with clean gasoline. Apply a coating of rubber cement to both surfaces, allow it to dry until it becomes tacky, then press the weatherstripping back into the channel. If it's badly worn, replace it with new weatherstripping.

**Doors.** A door that rattles is probably misaligned. Check the gap between door and fender, and between door and pillar. If it's wider for one door than its opposite number, readjust the hinges.

Loosen the offending hinge bolts and use a pry bar to reposition the door as required. Then retighten the bolt.

Readjusting the door will probably throw the striker plate out of line with the door lock. Therefore you must realign the striker plate for the door to lock properly. The proper distance between striker plate and lock is usually  $\frac{3}{32}$  to  $\frac{5}{32}$  in. This adjustment can be made by loosening the striker-plate bolts, removing the plate, then inserting metal shims behind it un-

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**TO DETERMINE** if loose chrome molding is a source of wind noise, tape each strip, then road test the car



**WORN OR LOOSE WINDOW** seals are another source of wind noise. Road test car after taping each window



**AN AUTOMOTIVE STETHOSCOPE** is an excellent aid in diagnosing engine noises. Tool sells for about \$7



## CHECK CHART FOR CHASSIS NOISES

PROBLEM AREA	KIND OF NOISE	TROUBLESHOOTING IT	REPAIRING IT
Loose or broken motor mount	Rumbling or shaking sound; vibration	Idle engine, pull up emergency brake and put car in gear. Observe engine; it'll rock if mount is loose	Tighten or replace motor mount
Bad shock absorbers or shock mountings	Rattling during driving	Test condition of shocks	Tighten mountings or replace shocks
Sway bar connections	Groaning as car corners	Check sway-bar connectors	Replace worn connectors
Glazed or poorly adjusted drive belts	Squeaking	Check belts visually	Adjust drive belts to specs; spray with silicone lube, or replace
Loose, bent or misaligned pulleys	Rattling	Check out pulleys with a stethoscope	Tighten, realign or replace pulleys as required
Loose or worn mounting brackets for generator, power steering pump, compressor	Squealing or rattling as engine idles	Use stethoscope method	Tighten or replace brackets as required
Unbalanced wheel assembly	Source of various body rattles	Look for vibration or shimmy at 45-55 mph; check wheel balance with tester	Balance wheels
Prop shaft misaligned bad U-joint	Another source of body rattles	Check for vibration due to driveshaft whip while car is still and in gear	Realign drive shaft; replace bad U-joints
Steering column couplings	Rattling during driving	Shake steering wheel to confirm this noise source	Tighten up on couplings or replace them with plastic ones
Exhaust system	Rattling or hammering	Examine visually; look for misaligned brackets, broken straps	Tighten or replace parts as required



til the correct clearance is achieved. These shims are available from your dealer.

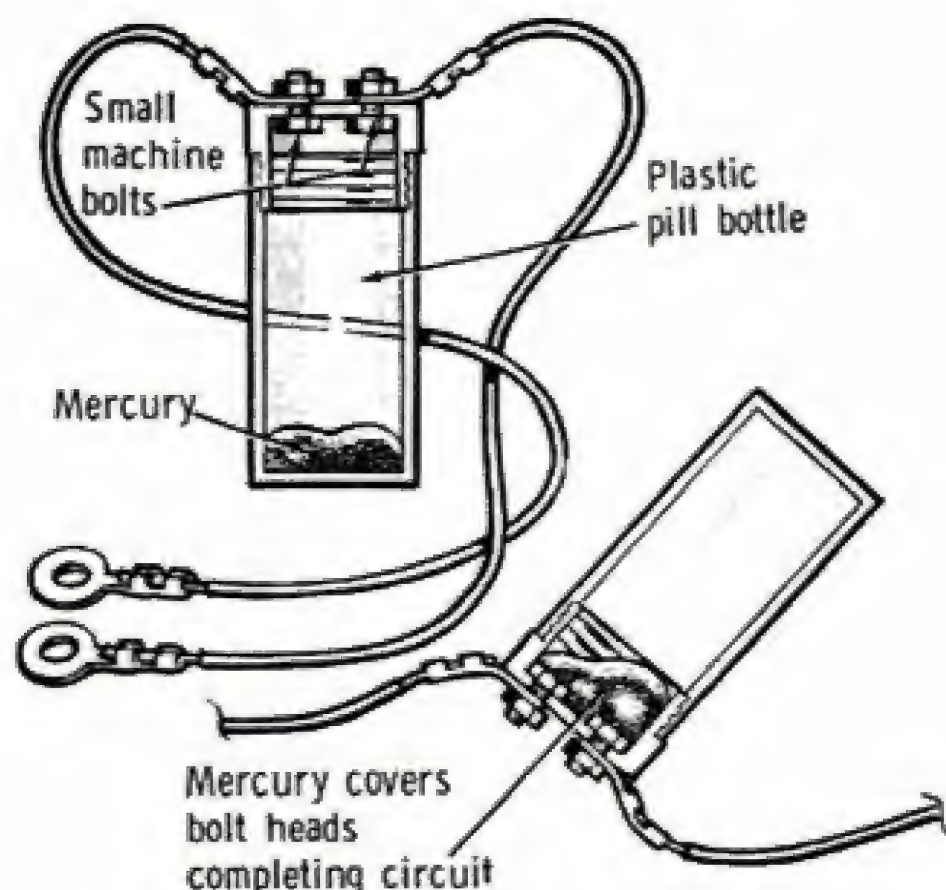
To check the clearance, clean the lock jaws and striker plate and apply a thin layer of dark grease to the striker. Then open and close the door a few times. This will reveal a pattern on the grease that can be measured to determine if the striker is properly located.

**Spot welds.** A broken spot weld on a unitized or semiunitized body can make a groaning, squeaking or snapping sound when the car hits a bump. Rejoining parted spot welds is a job for a body shop. Be sure the mechanic uses a spot welder and not a torch; a torch will spread the heat and cause undercoating to drop off, creating a whole new noise problem  
*(Please turn to page 214)*

**BE METHODICAL** when seeking out body noises, using a process of elimination to check off items one by one. Here a rattle is traced to a loose brake cable



## Homemade mercury switch

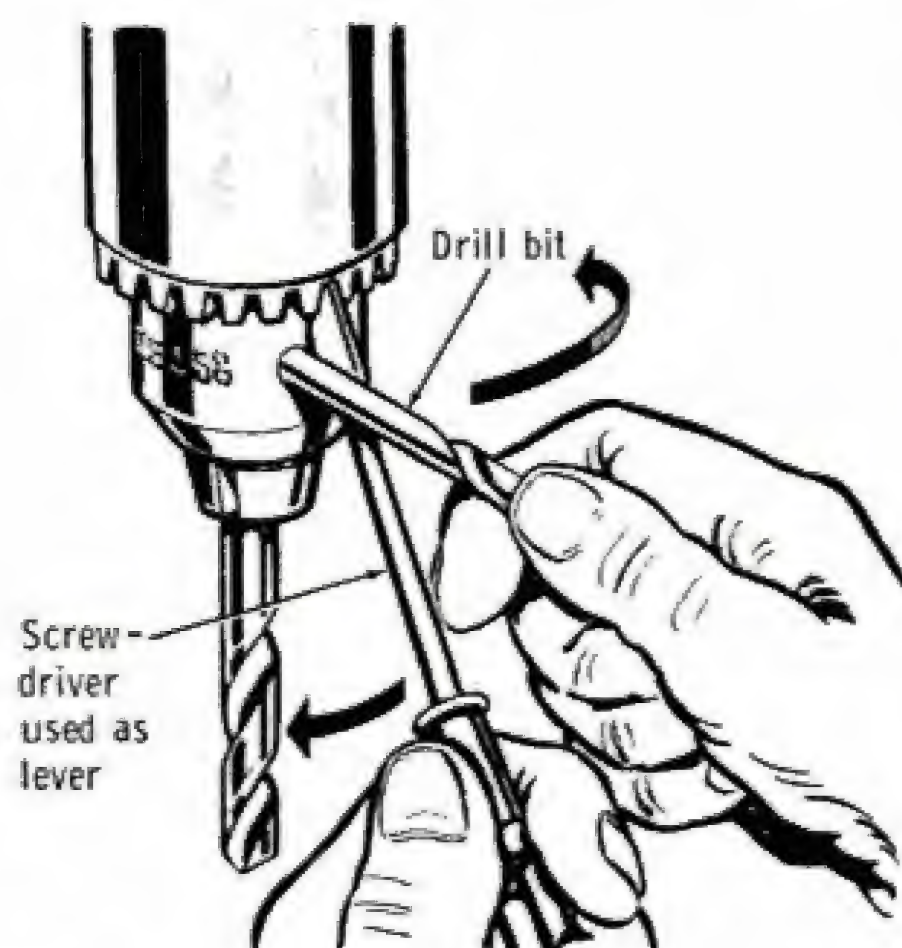


Make your own mercury switch from a small plastic pill vial. Thread two small machine screws through holes drilled in the cap, pour some mercury in the vial, then seal the cap in place. Secure leads to the screws with nuts. When vial is up-ended, mercury covers screw heads, thus completing the circuit. Cover the exposed nuts and bare wires with tape.

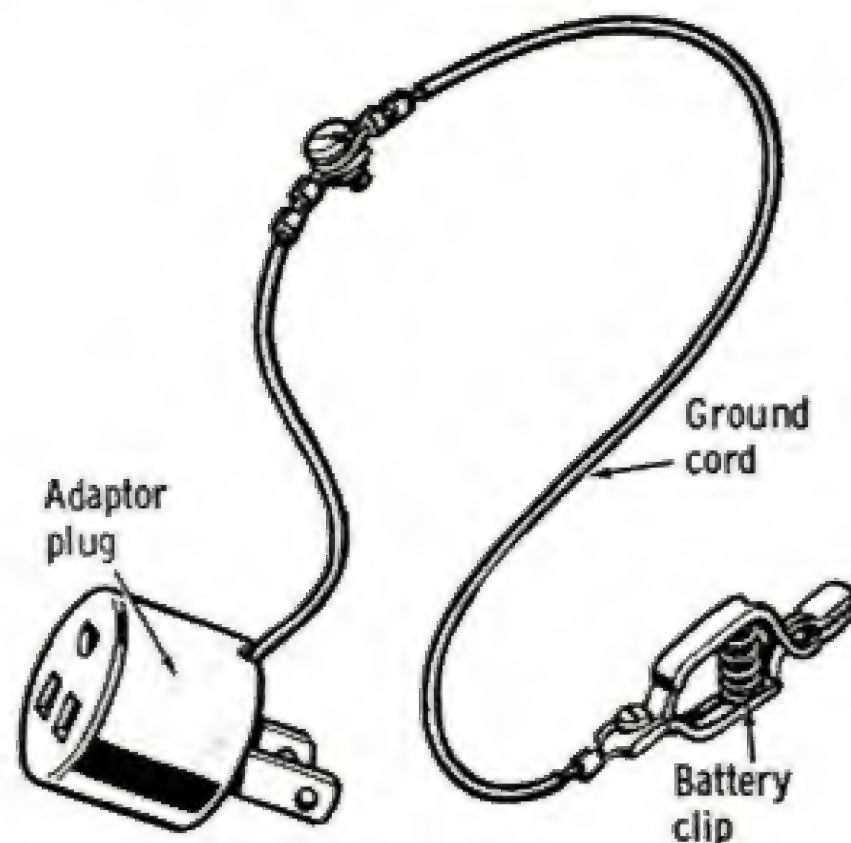
## Emergency chuck key

The best of us lose chuck keys now and then. The next time yours shows up missing, you can improvise one as follows: Insert the shank end of a bit into the hole for the chuck key; then use the bit as a fulcrum by which you can tighten or loosen the chuck with a screwdriver as shown.

—John R. Walker



## Ground for portable tools



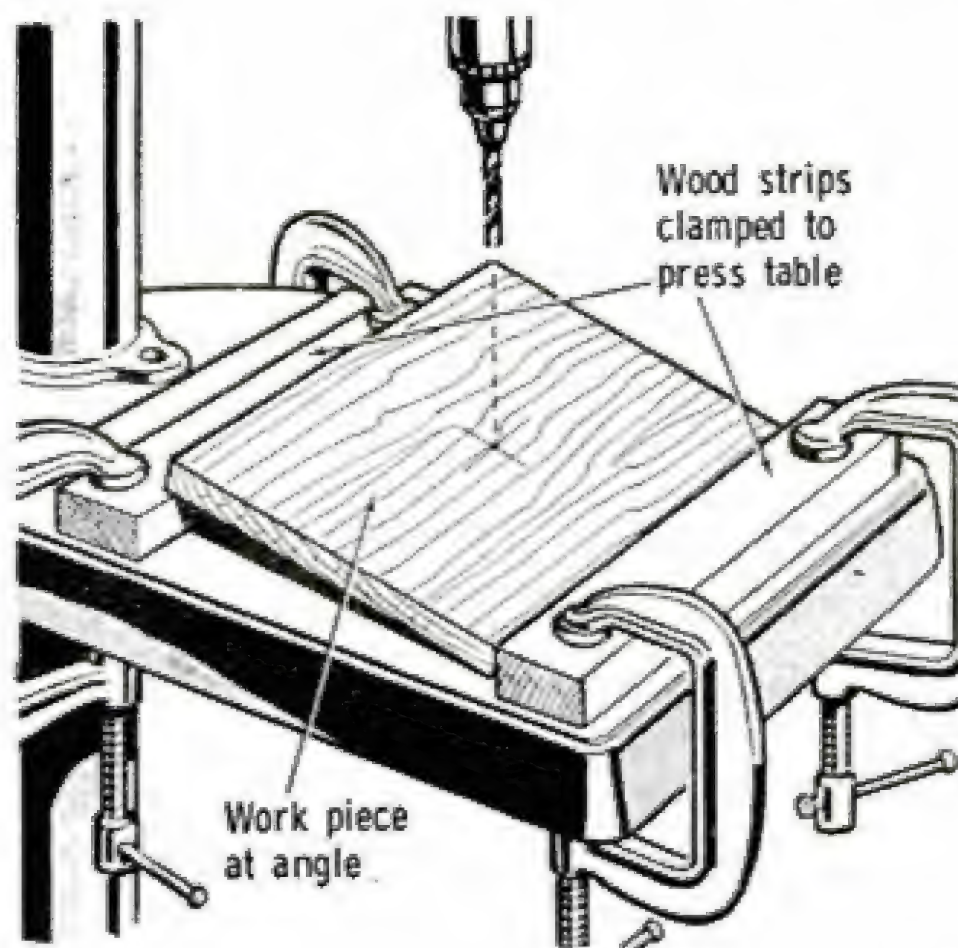
Lacking a 3-wire (grounded) extension cord or outlet when working outdoors, play it safe and use a 3-prong adapter plug at the tool end of a 2-wire extension cord. Connect the pigtail of the plug to a secondary single-wire lead having an alligator clip which can be snapped onto a water pipe or other suitable ground.

—B. F. Borsody

## Drilling holes at angle

Even though you may be able to tilt the table of your drillpress, it's often more convenient to drill holes at an angle by propping the work. Where there are a number of identical pieces to be drilled, a second block clamped to the front of the table will automatically position the work.

—Harold Lewis





# GIVE YOUR LATHE

**No attachment you can make for your lathe good than a headstock brake you apply by**

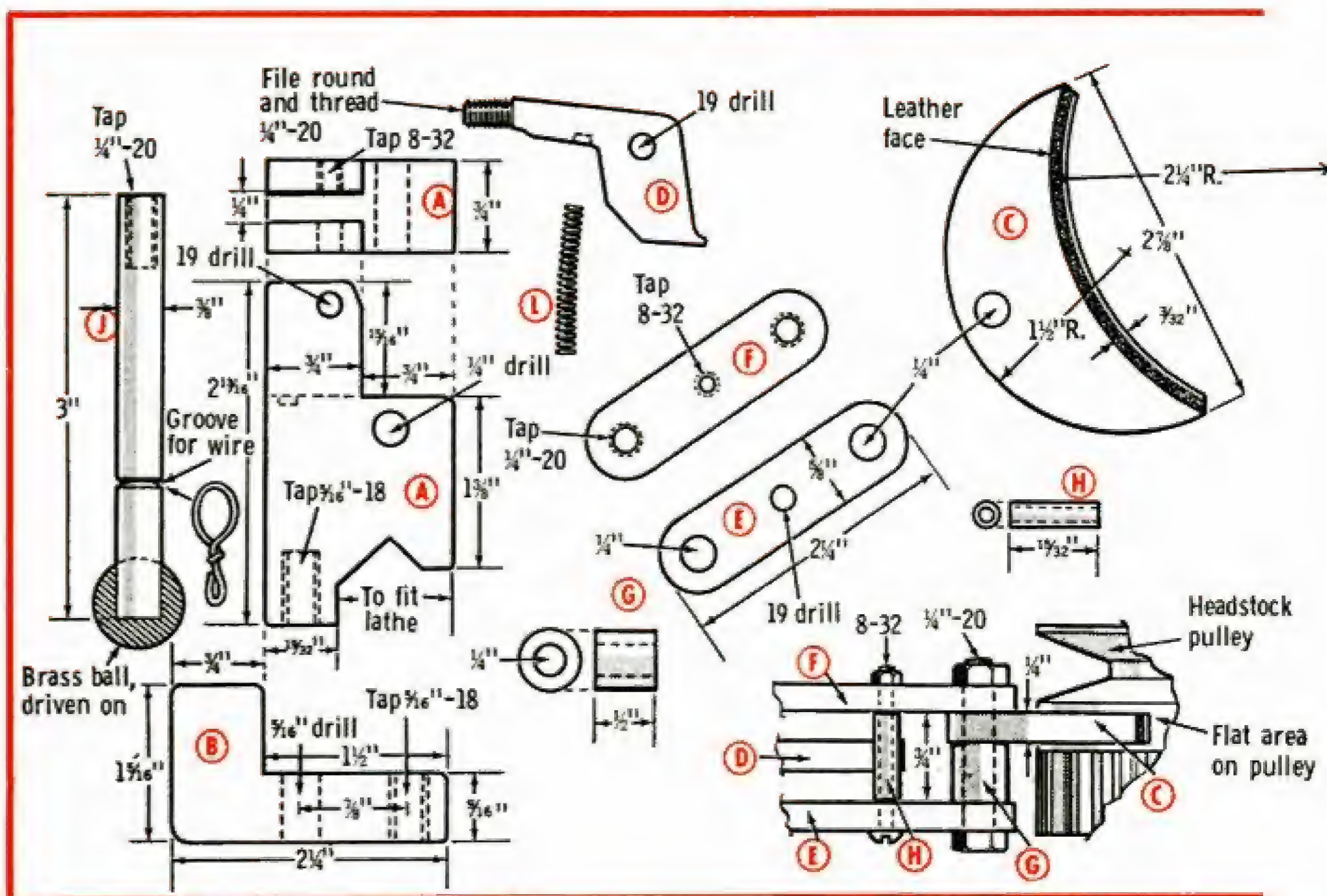
**M**AKE A HEADSTOCK BRAKE for your lathe and you'll increase safety, save valuable minutes—even improve work quality—by stopping the spindle quickly and holding it in a firmly "locked" position.

On many lathes, you can disconnect power from the headstock pulley by easing belt tension, but it usually takes time for the spindle to coast to a stop—and belt drag may prevent it from stopping completely unless some restraining force is applied. It's the job of this brake attachment to apply such force.

Also, stopping and holding the spindle is desirable in operations that require frequent "miking" of the workpiece—as when you're working close to finished size—or for critical inspection of the turned surface for smoothness. Or you may have

to stop the spindle while a finished part is unchucked and replaced by a blank. If you must stop and start the motor each time, the coasting will eat into your work schedule.

The attachment shown at the right, and "pulled to pieces" (with matching key letters) in the plans and photo below, was designed for a 9-in. South Bend Model A lathe. Its brake shoe bears against a smooth area about 1/4-in. wide on the four-step headstock V-belt sheave. It can be operated by a hand lever (far right) which also responds to elbow pressure, or by a "body button" which you lean against if you wish to keep both hands free. You can even equip it with a foot control, as detailed on page 191. Still another way to control the brake would be to link it to a belt-tensioning, clutch or

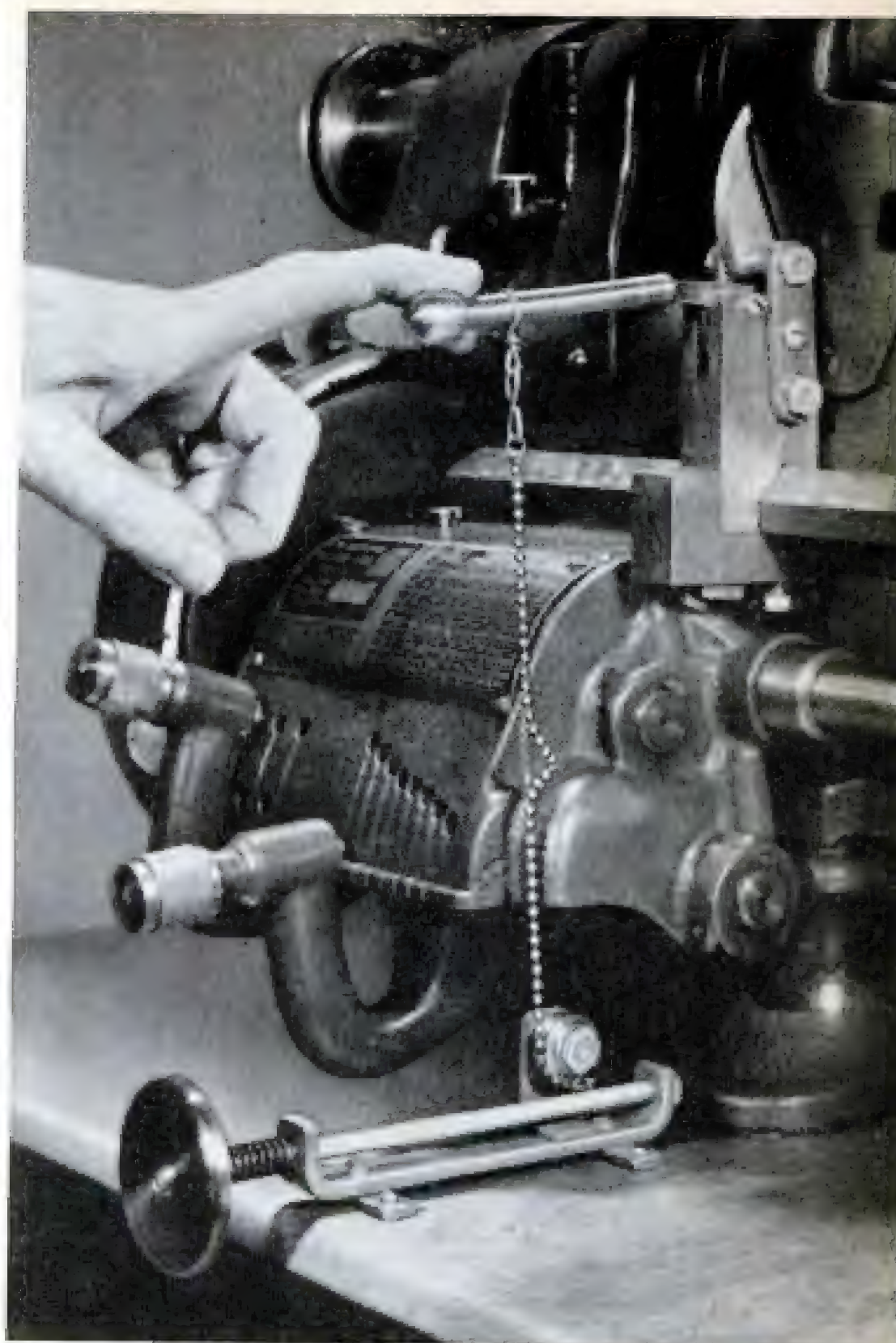




# A BRAKE

will do it—and you—more  
hand, hip or foot pressure

BY WALTER E. BURTON





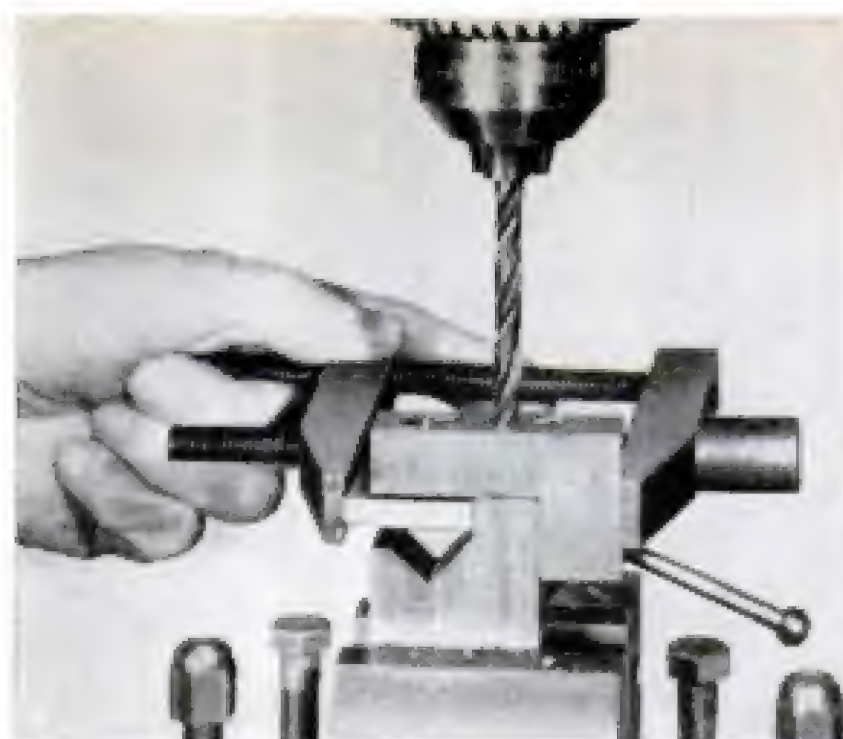


**LEATHER FACE** is glued to edge of brake shoe that's cut to match curve of pulley surface it will act against. Edge is roughened and coated with Pliobond

motor-switch lever so the spindle will be braked automatically each time the power is disconnected from it.

Since lathe pulleys vary in design and dimension, the attachment should be adapted to fit your particular lathe. Such adaptation will mostly concern the position of the brake shoe with respect to the spindle pulley, and the method of mounting the attachment on the lathe. If your headstock pulley has no area against which the brake can press, you might be able to install the brake so its shoe acts against the edge of a chuck plate or a special brake disc mounted on the headstock spindle behind the chuck. The pressure required is so light, there's no adverse effect on the spindle and bearings. A little leather belt dressing applied to the shoe lining and braking surface will increase the grip and make heavy pressure unnecessary.

The crescent-shaped shoe pivots be-



**CLAMP BLOCKS A and B** together as shown while drilling for bolt that holds them together, using tap-size bit #F. Then enlarge hole in part B to  $\frac{5}{16}$  in.

tween arms E and F which, in turn, pivot from body block A. Cam D operates in a slot at the top of A. Its front edge moves against roller H, positioned at midpoint between arms E and F. The bolt around which this cam pivots should be positioned so the brake shoe has a forward-and-back movement that's more than sufficient to apply and release the brake—about  $\frac{1}{2}$  in. for the model shown. Lever J threads onto the cam stud and is more convenient to grasp if it's tipped with a ball, drilled for a drive fit. The groove for the chain loop should be about  $2\frac{3}{8}$  in. from the tapped end.

Two springs hold the brake normally in an "open" position. One (K) is bent from music wire to the approximate shape shown in the photos on page 189, and its lower end is attached to A with two short 8-32 bolts in tapped holes spaced about  $\frac{7}{16}$  in. apart. The lower bolt passes through the wire's eye; the upper bolt

## PARTS KEY AND MATERIALS LIST

Part No.	Material	Part No.	Material
A,B	$\frac{3}{4}$ " mild-steel plate or cast iron	1	$\frac{3}{16}$ " x $\frac{3}{4}$ " steel strip
C	$\frac{1}{4}$ " steel or aluminum plate	2	$\frac{1}{8}$ " x $\frac{1}{2}$ " steel strip
D	$\frac{1}{2}$ " steel plate, hardened for wear	3	$\frac{1}{8}$ " x $\frac{5}{8}$ " steel strip
E,F	$\frac{3}{16}$ " x $\frac{5}{8}$ " steel strip	4	Machine from $\frac{3}{4}$ " steel rod
G	Machine from $\frac{1}{2}$ " brass or steel rod	5	$\frac{1}{4}$ "-20 x $6\frac{1}{2}$ " bolt
H	Machine from $\frac{1}{4}$ " brass or steel rod	6	Steel or brass disc $\frac{1}{4}$ " thick
I	(Omitted to avoid confusion)	7	Compression spring of more than $\frac{1}{4}$ " i.d. $1\frac{1}{2}$ " long
J	Machine from $\frac{3}{8}$ " rod. (Ball is $\frac{3}{4}$ " dia.)	8	Chain or flexible cable
K	Hardened-steel (music) wire, No. 22 (.049")	9	Spring, $1\frac{1}{2}$ " long
L	Compression spring of less than $\frac{1}{4}$ " o.d., $1\frac{1}{4}$ " long	Bolts	Sizes as shown. Lengths: bolts connecting E and F: $1\frac{3}{16}$ ", pivot bolt for cam D: $\frac{3}{4}$ ", two $\frac{7}{16}$ "-18 bolts: $\frac{3}{4}$ " (for setscrew) and $1\frac{1}{4}$ "
Leather	Strap about $\frac{3}{32}$ " thick, width of shoe face		



acts as a tensioning stop. At the top end, a groove is machined in the nut to seat the wire loop. This spring holds the shoe away from the pulley when handle pressure is relaxed. The coil compression spring (L) seats in shallow holes drilled into A and D, and holds lever J in an "up" position when the brake's not in use.

The bolts that serve as a pivot for D and an axle for roller H should have unthreaded sections where these parts bear against them—or the threads can be filled with solder to increase the bearing area.

Notch body piece A to fit the front V-way on your lathe bed, and anchor it there with two bolts passing through part B. One of these bolts acts as a setscrew to exert pressure against the bottom of the bed overhang. Brake shoe C can be mounted at any point between the arms by means of suitable spacers (G).

The body control, right, is simply a sliding rod that exerts a downward tug on a chain when the large button projecting beyond the bench edge is pushed. Dimensions aren't critical, but the rod (5) should travel at least  $\frac{3}{4}$  in.

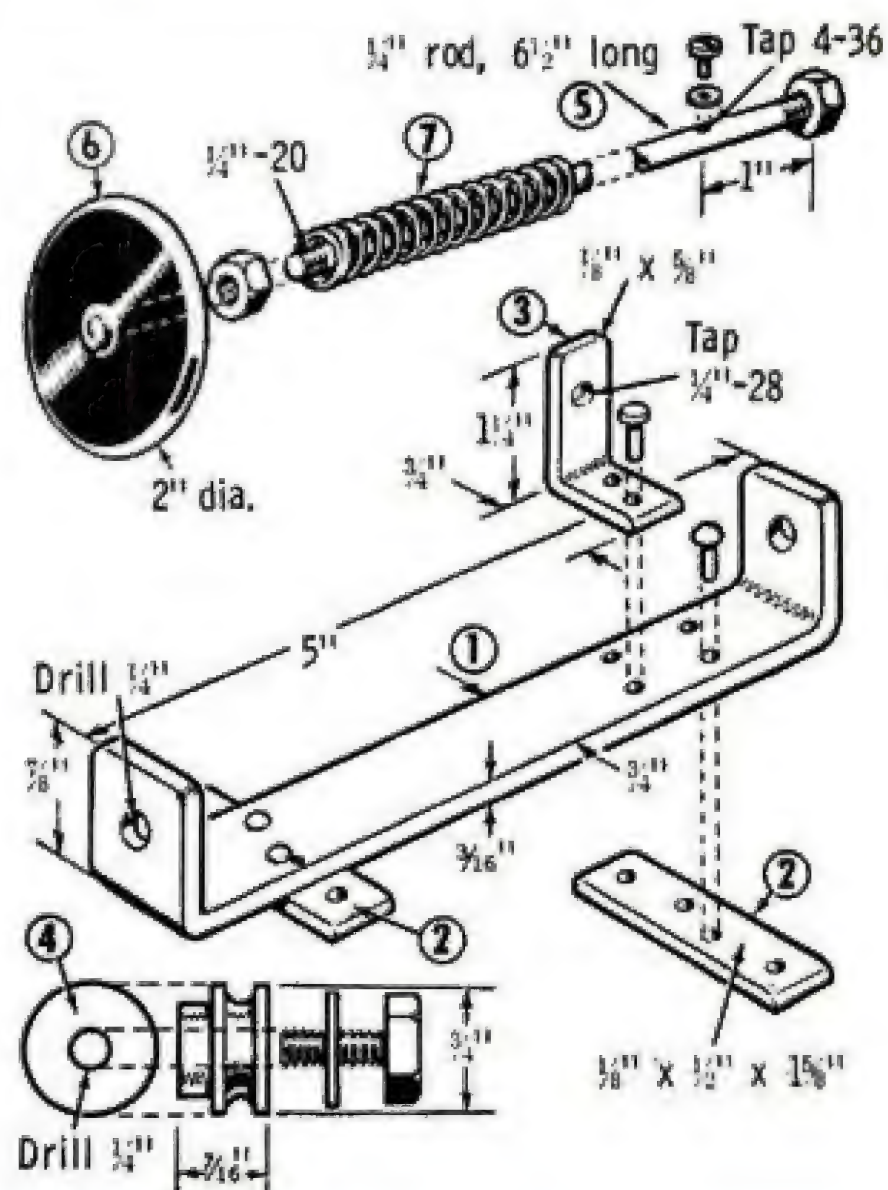
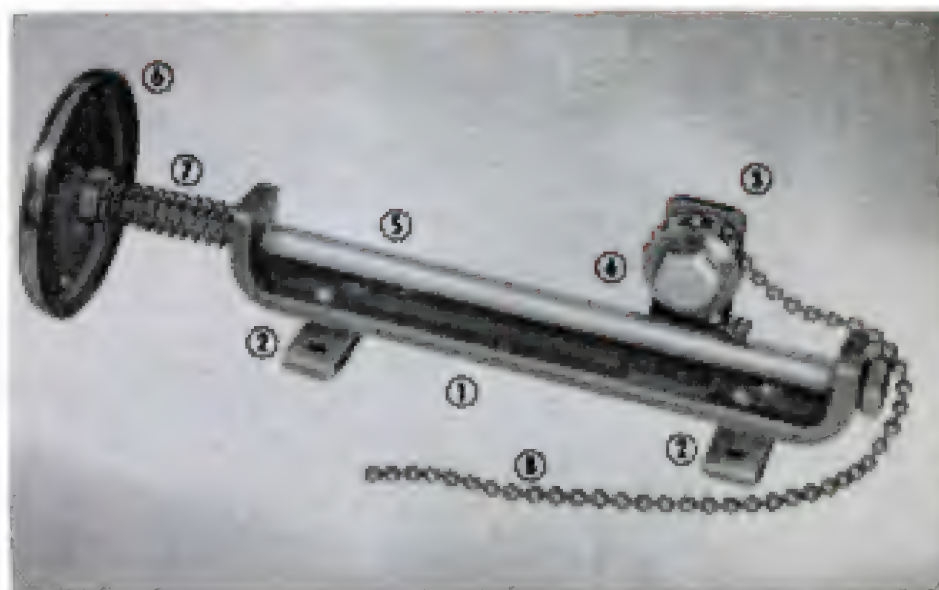
Parts 1, 2 and 3 are made from any type of steel strip, assembled with  $\frac{1}{8}$ -in. iron rivets. A coil spring (7) goes between the end of part 1 and the nut that locks the button (6) on the rod. It keeps the pull-chain relaxed. This chain, operating around a pulley (4), is anchored to a small bolt threaded into the rod. The ball-type chain shown (familiar on ceiling lamp sockets) is strong enough for the job, but any chain or cable that will operate around a pulley is suitable. The reason a weak tensioning spring has been "spliced" into the chain to take up slack is that the chain otherwise tends to jump out of the pulley whenever the brake is operated by the hand lever. The slack-spring shown in the top photo on page 189 was made of .010-inch steel wire.

The control unit is positioned on the bench top so that the button comes nearly flush with the bench edge when the brake is fully applied. The pulley (4) should be in approximate vertical alignment with the lever's wire loop.

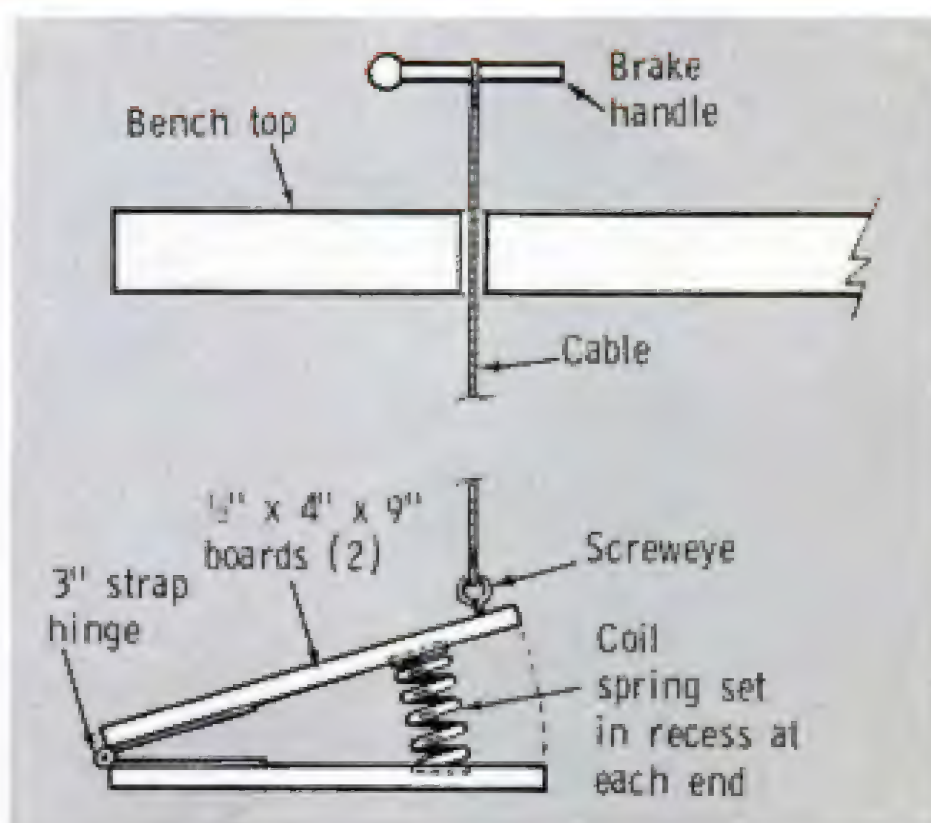
All working parts should be kept lubricated. If you find that chips clog the body control unit, you could make a simple sheet-metal cover for it. ★ ★ ★

OCTOBER 1966

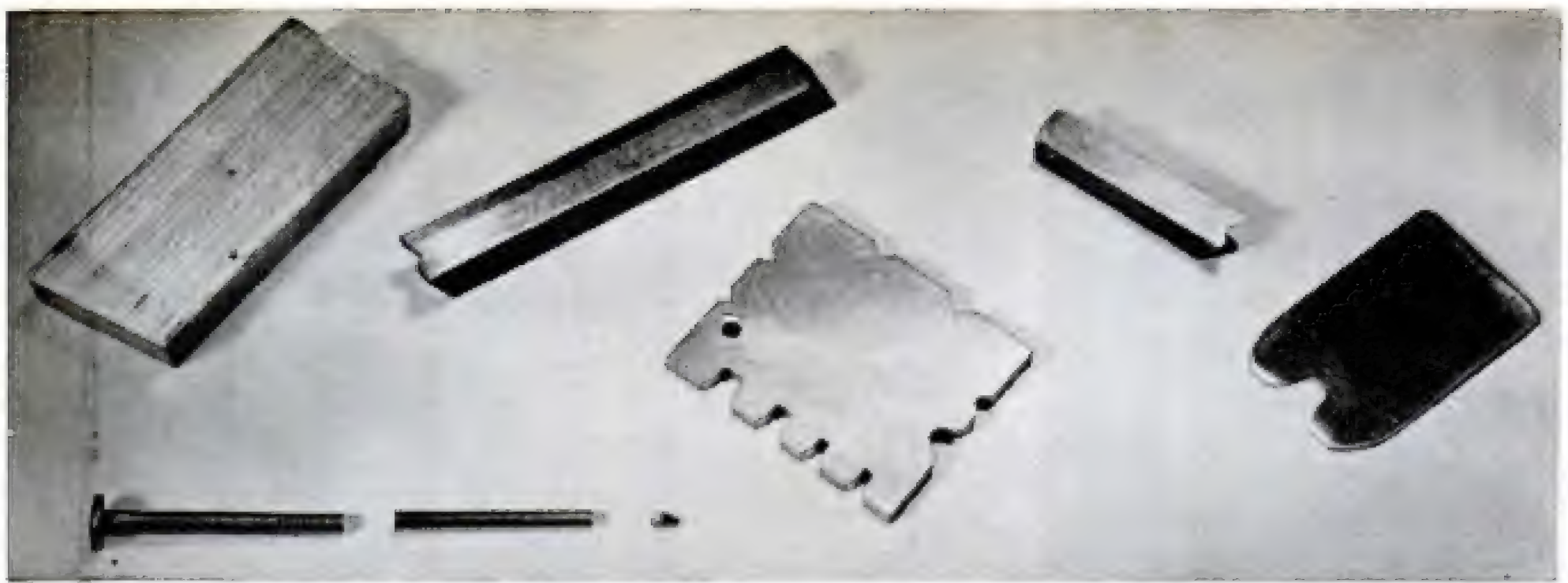
## BODY CONTROL



## FOOT CONTROL







## Make your own vise scrapers

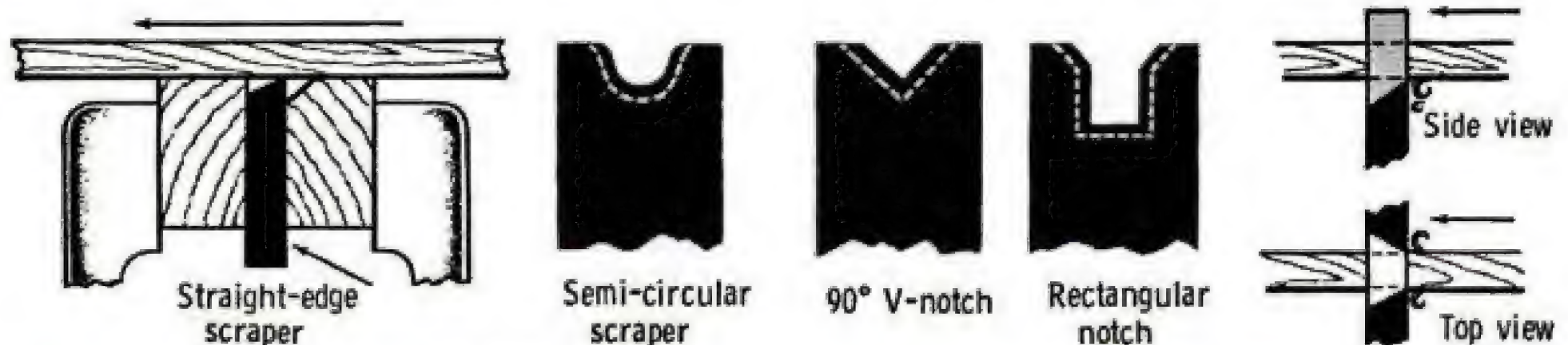
**F**ROM SCRAP STEEL plate, bar or rod, you can fashion scraper bits that convert your vise into a tool for slimming or tapering rods and dowels, rounding and chamfering edges, or smoothing surfaces and squaring corners of metal, plastic, wood and bamboo. The photo above suggests the range of shapes such bits can take. From left to right, these include:

A straight-edge scraper made from an old lathe bit, a V-notch in the end of a  $\frac{3}{16}$ -in.-sq. lathe bit, a steel plate with a series of notches in each of the three shapes sketched below, a  $\frac{1}{4}$ -in.-sq. bit with a

half-round notch (shown in use in the photo below, right) and a  $\frac{1}{16}$ -in. sheet with a rounded, flared notch. In the foreground is a taper pin scraped from a common nail with scrap portions cut off.

Bits can be made of stock tool steel, cold-rolled steel case-hardened (or unhardened for limited use), old files and high-speed or carbide lathe bits.

The sketches below show how cutting edges are formed by beveling the notches. Note that half-round and rectangular notches must be flared at top so oversize work is shaved down gradually.—W.E.B.



**WISE 'PLANE'** is formed by sandwiching straight-edge scraper between blocks which act as tables to support work (bamboo, here) and limit depth of cut



**ROD OR WIRE** can be slimmed down by drawing through half-round notch in high-speed-steel lathe bit. Two plywood blocks protect fingers from cutting edge



## Rust protection for tools

Save those small bags of silica gel which you find packed with photo equipment and instant color film. These crystals are super-efficient in soaking up moisture and can be used in the workshop to protect fine tools and instruments from rust. Just place a bag or two in any tool box, preferably not in direct contact with the tools themselves. When the crystals change color, it means they have absorbed all the moisture they can. To reactivate, dry the bags in a low oven.—*Hank Hilton*

## Removable bench stop

Always ready when you need it, a simple swing-out bench stop can be made from a large U-bolt. Just drive two large staples into one edge of the bench to support the bolt and bore a hole in the top of the bench to take one of the legs when the bolt is swung into position as a stop. Be sure to position the hole so that the bolt will be at right angles to the edge of the bench when it's swung over to act as a stop.—*Daniel Bousha*

## Soldering pads for vise

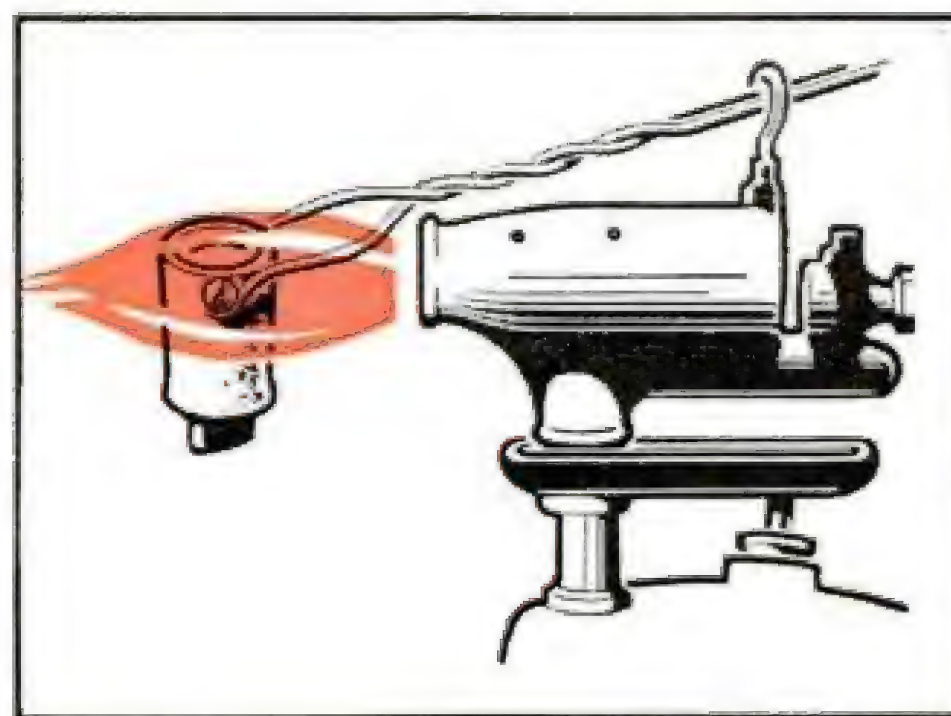
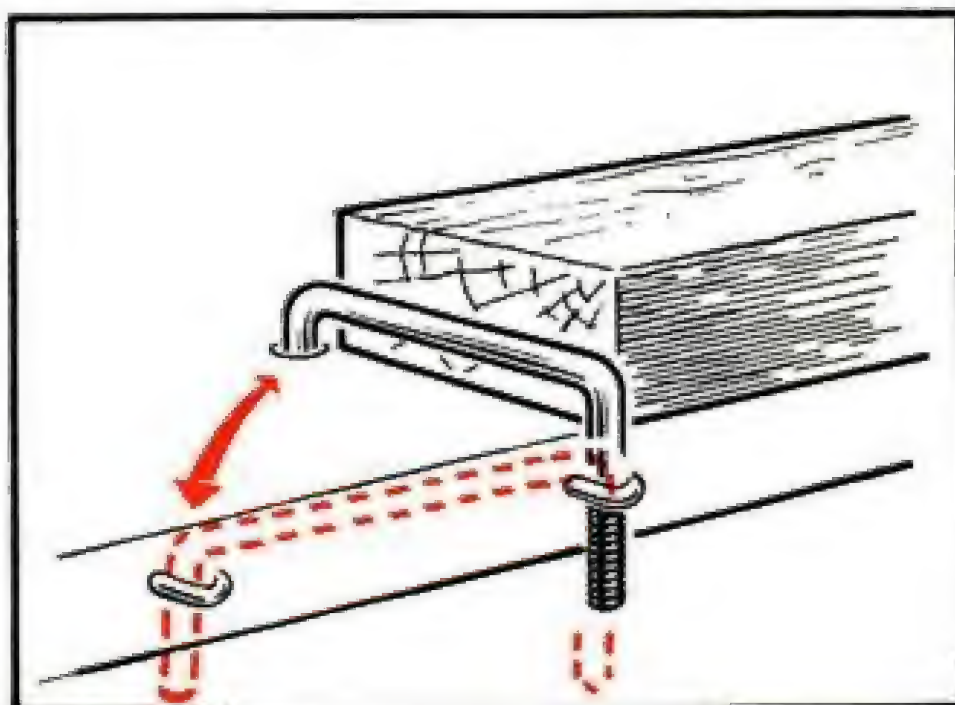
One of the handiest (and least expensive) soldering aids for the home workshop is a pair of strips cut from an asbestos shingle. When used as pads to hold work to be soldered in a vise, they will prevent the heat from the soldering iron from leaking off into the heavy vise jaws. Cut several sets of pads at one time so that you can use a number of thicknesses of asbestos if necessary. It's like having an extra heatproof hand.—*Herbert Moon*

## Pigtail tinning pot

A solder-dipped pigtail joint makes a fine electrical connection, but it's seldom handy to dip a pigtail in a regular ladle, especially if it's in a crowded ceiling box. A miniature pot for such use can be made from a 1/2-in. pipe coupling with a 1/2-in. plug in one end. Tap it for a couple of machine screws to attach a handle bent from No. 9 steel wire. The pot takes very little solder to fill it, and is self-leveling when cradled between ends of the handle.

—*M. K. Adams*

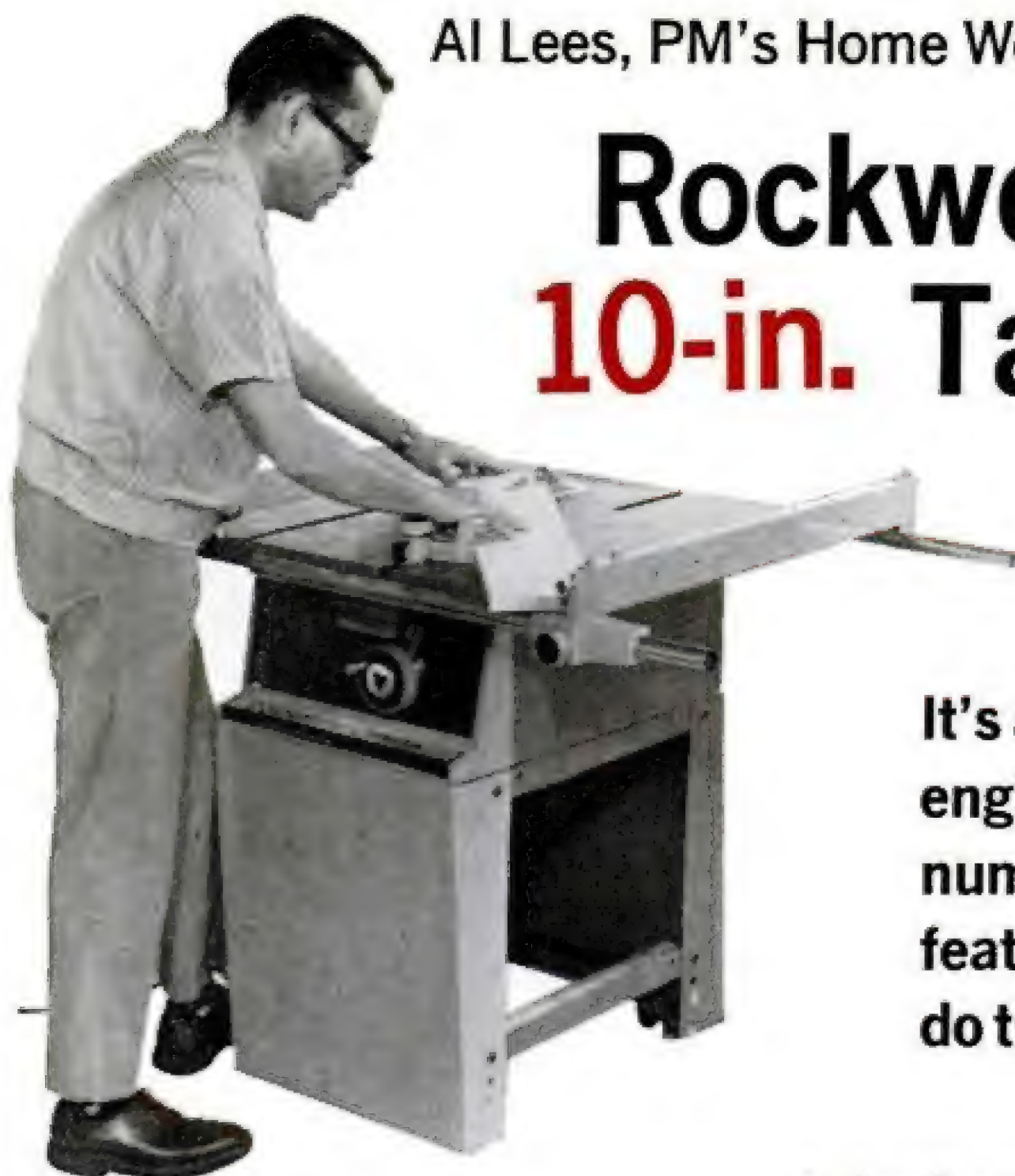
## Hints from PM readers





Al Lees, PM's Home Workshop Editor, tests

# Rockwell's **New** **10-in.** Table Saw



**It's a husky, well-engineered tool with a number of exclusive features, but what's it do that other saws don't?**

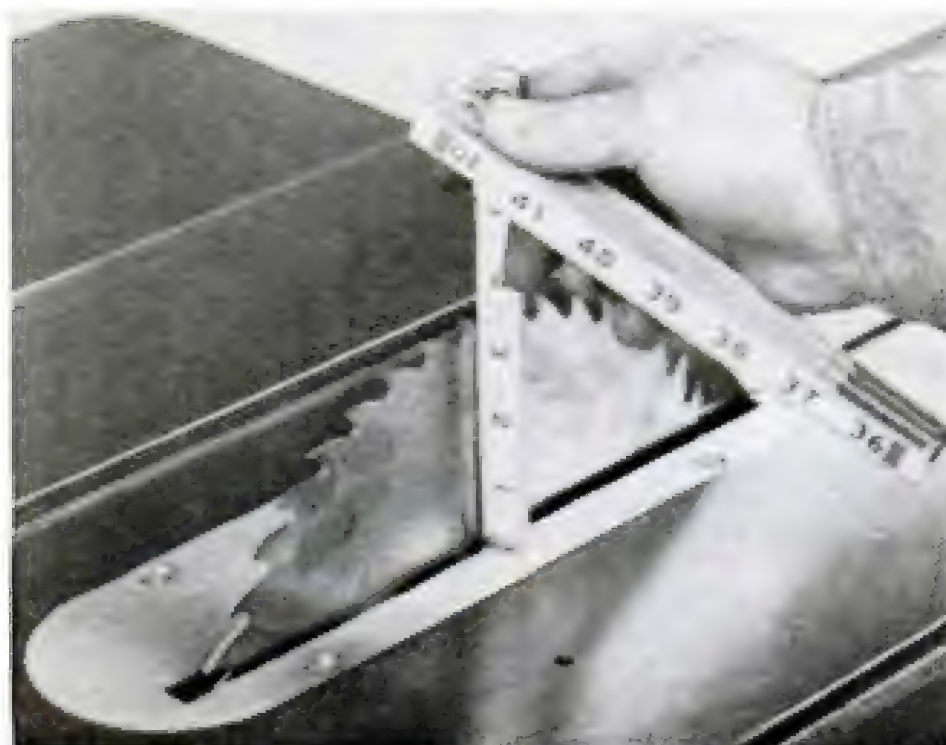
**IT'S THE RUGGED**, well-designed saw you'd expect from a company with Rockwell's reputation—but is the machine really *new*, or merely a style change for planned obsolescence, a la Detroit? If you already own a table saw, what's this one offer that might warrant a trade-in?

That's what *PM* set out to discover when we assembled the 10-in. Model 34-301 from 175 lbs. of shipping cartons. As it went together (easily, with adequate

instruction sheets) my first response was to the machine's heft and good looks. But I ended up admiring most the extra versatility and ease of operation that comes from a couple of unique features introduced on this model.

The first is so simple an idea you wonder why it's taken all these years for a designer to think of it: the guide bars can be mounted to position the fence to the *left* of the blade as well as to the right. Chances are you won't need this feature very often, but it's nice to know that

**BLADE ADJUSTMENTS** are all made on top of table. Since there's no depth-of-cut scale, you must measure to blade's top tooth (left photo). Maximum cut is 3¼ in. and perfect 90° settings are made by backing off adjustment screw and checking with try square (right) while turning tilt wheel until blade is flat against square





when you want to bevel the right edge of a veneer-faced plywood panel you won't have to improvise a left-hand fence. With two extensions, the 27-in.-deep table spreads 36 in. wide, offering firm support for a full 24-in. rip capacity right and left.

The other innovation is that all blade adjustment features have been brought "up top" as shown in the photos. This lets you make accurate settings without going through contortions, and I can appreciate that over a weekend's cutting for a fairly complex project this fact would make the work quicker and less tiring. My only reservation about the dual handwheel is that the crank for raising the blade is too short for a secure grip.

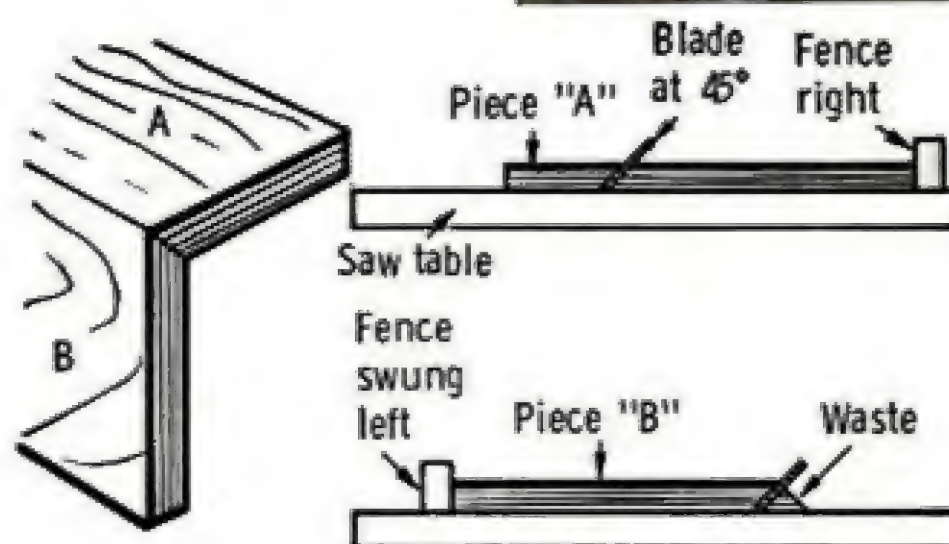
The 10-in. blade gives a maximum depth-of-cut of  $3\frac{1}{4}$  in. at  $90^\circ$ ,  $2\frac{1}{8}$  in. at  $45^\circ$ . It's powered by a "built-in"  $1\frac{3}{4}$ -hp motor that's ready to plug in, with no mounting of belts or pulleys. The arbor is offset from (and belted to) the motor shaft, and a clutch allows blade slippage under overload. This protects both you and the motor—you from kickback, the motor from stalling and burn-out. There is, of course, no blade drag, so there's no braking effect. I clocked the coast-to-stop time at 20 seconds. The drive mechanism is fully enclosed for safety, and a seesaw on-off switch is conveniently mounted on the front panel—perhaps too conveniently: there's no lock, so I'd advise unplugging the machine when it's not in use.

The 34-301 we tested and photographed comes with table extensions, retractable-caster stand, combination blade and Rockwell's well-known miter gauge with lock-

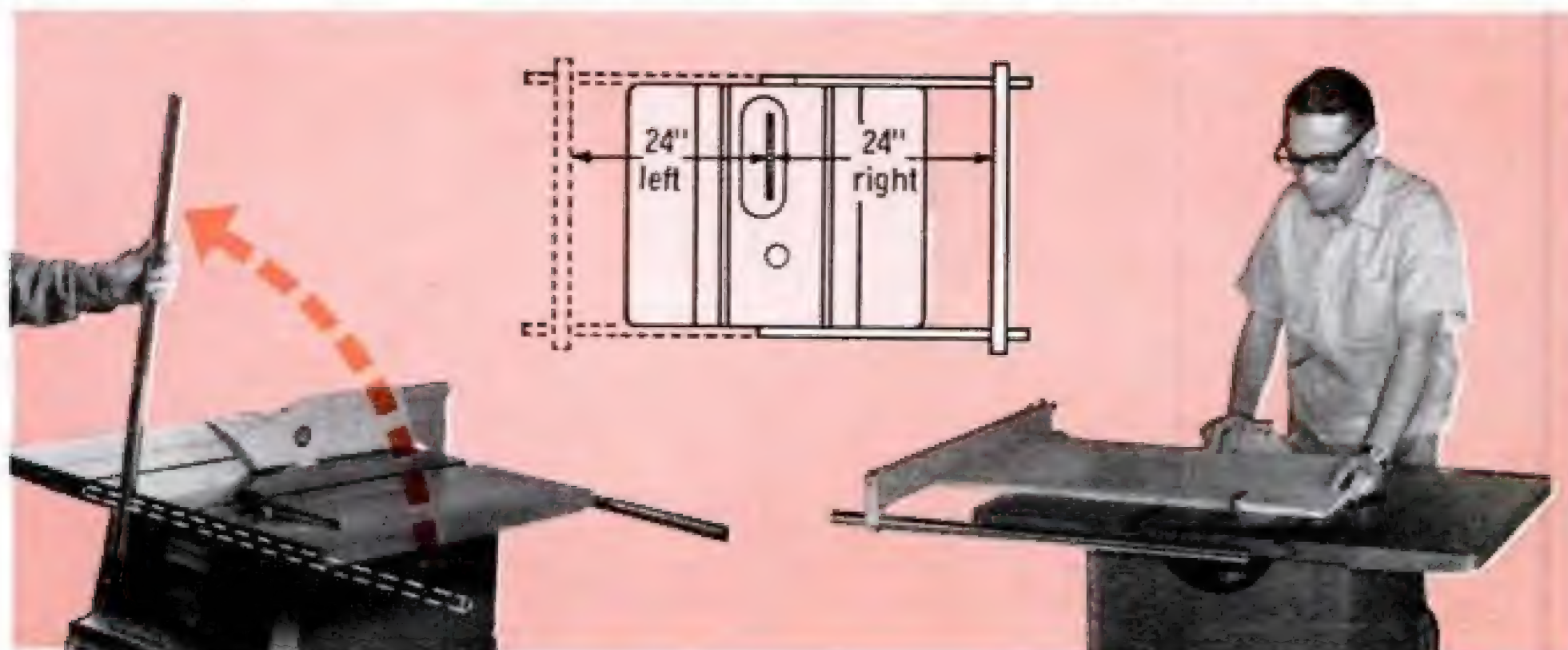
*(Please turn to page 215)*



**BEVEL-TILT SCALE** is read through lens set into table top while you turn knurled outer ring of adjustment wheel to desired angle up to  $45^\circ$ . Inner wheel with crank is for depth-of-cut setting



**BLADE OF TILTING-ARBOR SAW** swings only to right, so to cut miter on Piece B in sketch above, you'd have to flop plywood panel and make pass with veneer face (heavy black line) sliding against table. Any foreign matter caught between would mar veneer. But with fence left of blade you can miter Piece B face up





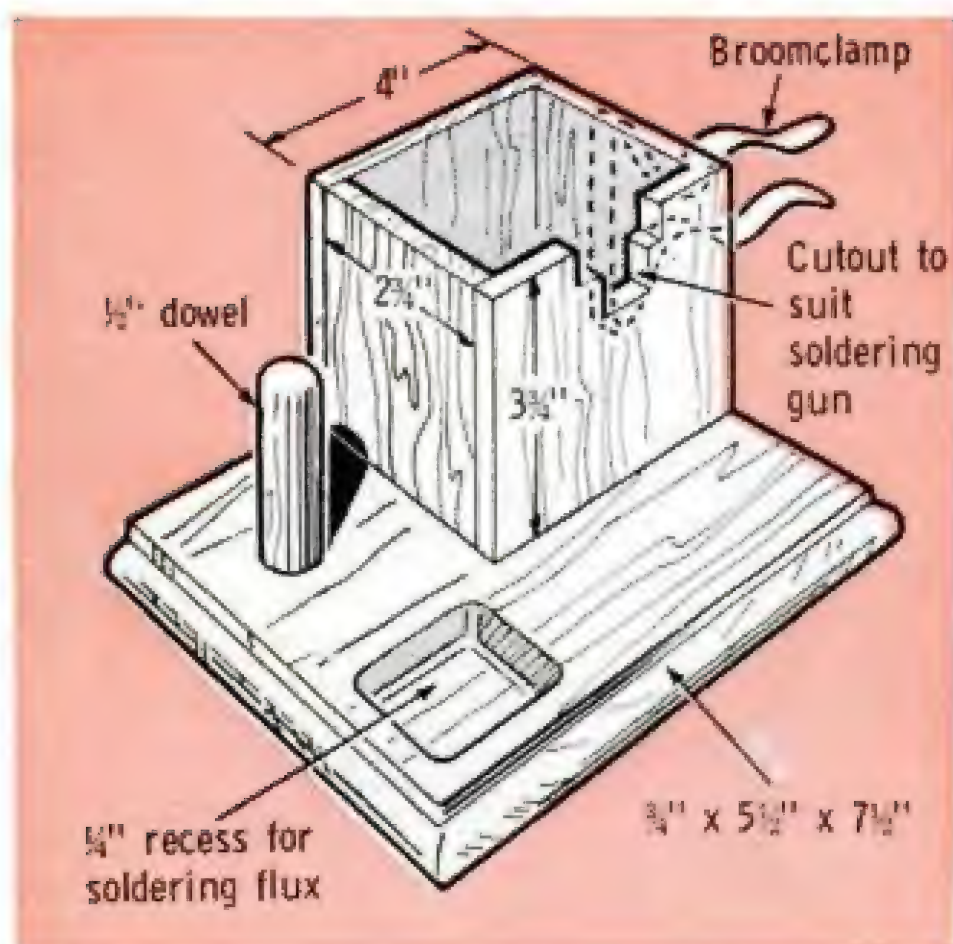


## Soldering caddy

**KEEPING TRACK** of scattered soldering essentials is no problem with this little caddy. Your gun, solder and flux, plus a wad of steel wool for cleaning the tip, are all stored together. A tool clip will keep a soldering pencil handy, and by adding a couple of screw eyes to the side of the gun holder, a "soldering aid" will always be there when you want it.

The notch which cradles the gun in the edge of the box is made to suit the trigger; the flux can sit in a recess and the solder spool fits over a dowel.

A handy accessory (shown below) for holding phono plugs on end for soldering consists of a notched aluminum bracket fastened to a 6 x 6-in. wood base. A couple of alligator clips serve to hold the cable, and the base can be made burn-proof with a piece of standard solder block cemented to the top.—*Frank P. Fritz*



## NEXT MONTH IN SHOP AND CRAFTS

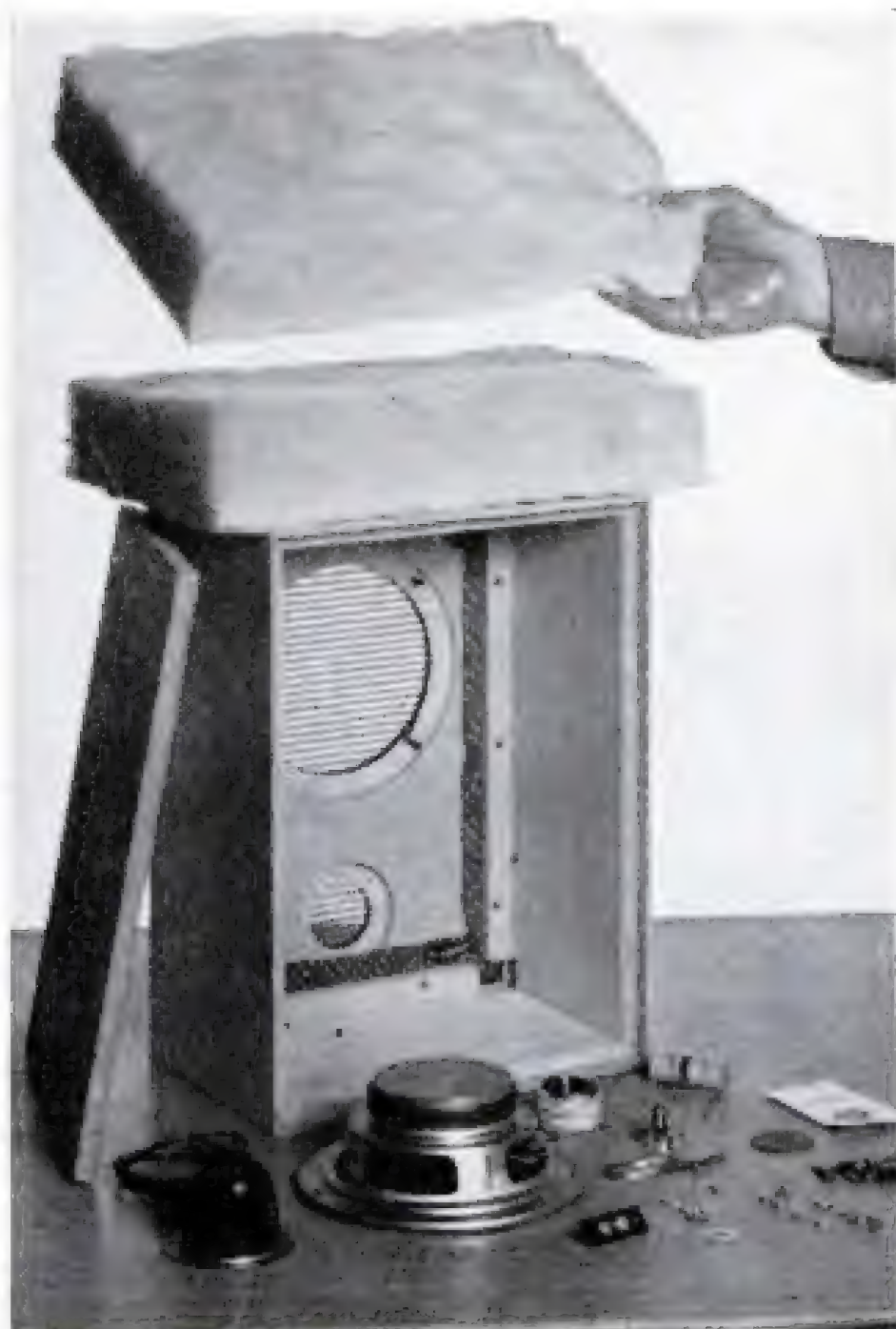
**BUILD THIS TABLETOP PRINTING PRESS.** An ideal project for any hobby center or school shop, this small press does a top-quality job of reproducing type, linoleum blocks, wood cuts and etchings. Handles 'plates' up to 14 in. wide, can be built for only a fraction of what a commercial press costs. It's a project the advanced PM metal craftsman will relish.

**HOME 'THEATER' WALL.** Another in our series of unique projects from Bill Baker's famous "house of ideas" in Westport, Conn. Through the employment of rear projection, the viewer has a choice of showing slides, 8 and 16 mm movies, as well as black and white TV, on a king-size 4 x 4-ft. screen. Automated by pushbutton control, this entertainment wall becomes a most unusual conversation piece when lights start dimming, music begins and doors slowly part at "curtain" time. You'll find complete plans for building it next month.

**CYCLE, MOWER AND TRACTOR GARAGES.** If there's room in your garage for that rider mower you bought last summer, you're fortunate. In most cases, there's hardly room left for the family cars. Just where does one park such bulky things as a rider mower, yard tractor or a motorcycle when winter comes? In a garage all their own, of course. You are given a choice of four midget garages which are provided with ramps to let you drive or wheel the vehicle right in. You'll find complete plans for all four designs in the November PM.



# NEW IN ELECTRONICS



**Even the plastic gloves** for handling the fiberglass enclosure lining are supplied with Sonotone's compact speaker system kit. The Sonomaster Model RM-1K is a  $14\frac{1}{2} \times 10\frac{1}{2} \times 7\frac{1}{4}$ -in. package that can take 40 watts of average input with 80-watt peaks, and dish out 45 to 20,000 cps. Unfinished birch veneered system is a \$35.50 equivalent of Sonotone's factory-made RM-1



**Wollensak's 4100** cordless tape recorder features cartridge loading. The cartridge, three of which are included in purchase price of \$99.50, has  $1\frac{1}{2}$  hours on each side. Recorder batteries, also included, are good for 20 hours. A dynamic microphone and cable and handy carrying case are also included with the 2-track, monaural recorder



**Mustang jockey** doesn't need a license (not even from the FCC) to take his radio controlled wheels through hairpin course. Transmitter and car are marketed by the Testor Corp., Rockford, Ill. Price is \$79.95



# Put a guitar amplifier in your pocket

This pocketful of electronics puts out an earful of sonics when you broadcast your signal through an AM radio

BY LARRY STECKLER

**H**ERE IS A GUITAR AMPLIFIER that you can carry around in your pocket, yet whip out whenever you need it and put it right to work. How is it possible? Simple: the amplifier isn't really an amplifier at all—it's actually a miniature radio transmitter. The microphone on your guitar picks up the vibration of the strings as you pluck out a tune, feeds it to the transmitter, which in turn sends the signal to any nearby AM radio which amplifies the signal just as it would any broadcast signal.

Since the transmitter is battery powered, you can use it with a battery powered radio and take a completely portable

*(Please turn to page 218)*

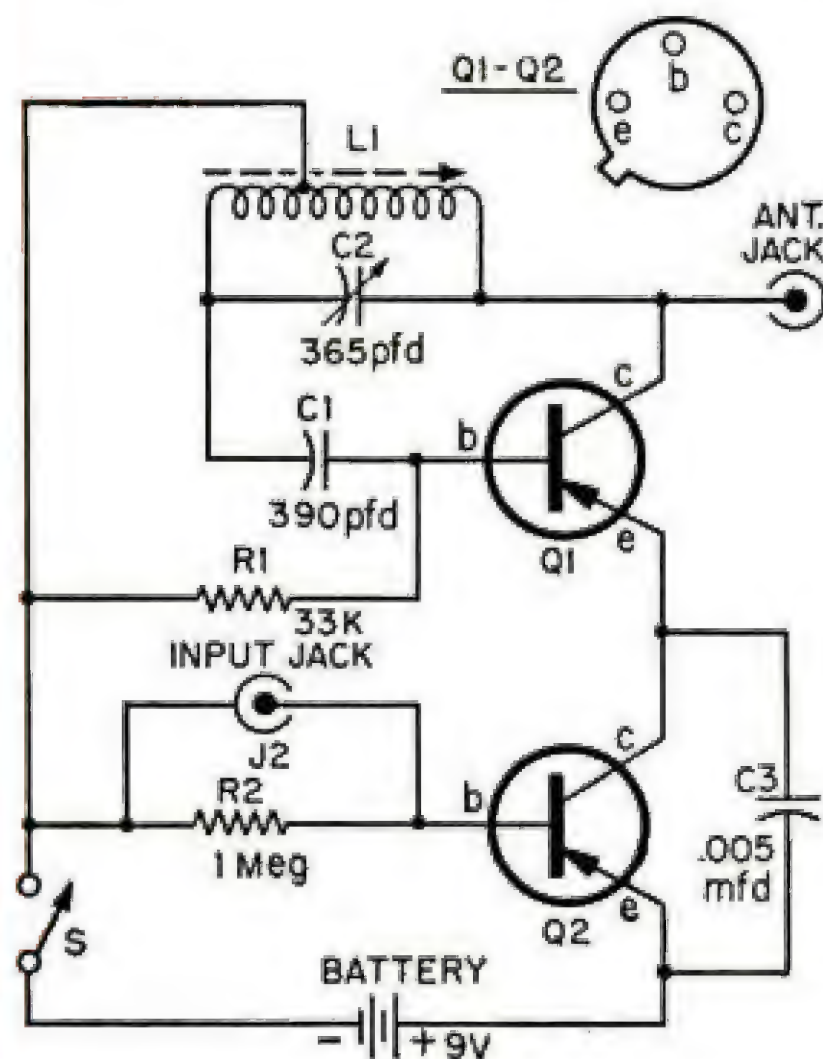
## Parts List

**R1**—33,000 ohms, 1/2-watt carbon resistor  
**R2**—1 megohm, 1/2-watt carbon resistor  
**C1**—390-pfd disc ceramic capacitor  
**C2**—365-pfd air variable capacitor  
**C3**—.005-mfd disc ceramic capacitor  
**\*Q1, Q2**—P-404 transistors (\*1 each)  
**\*L1**—Ferrite core antenna coil Philmore 1950D or equiv.) (\*\$1.25)  
**S**—S.p.s.t. slide switch  
**J1**—RCA phono jack (antenna jack)  
**J2**—Miniature phone jack  
**Battery**—9 volts (Burgess 2U6 or Eveready 216 or equiv.)  
**\*Microphone**—Contact or crystal (contact type CM-100— or crystal LM-100—\$1.50 each)  
**\*Plastic case**—3 1/8 x 2 1/8 x 1 1/2 inches (\*No. 99, \$1.00)  
**Antenna**—6-foot length of hookup wire connected to center conductor of RCA-type phono plug  
**Cardboard chassis** (or phenolic plastic)—2 7/8 x 1 3/4 inches  
**Broadcast band tuning dial**  
**Miscellaneous hardware.**

\* All of these parts, manufactured by Bowman Electronics, Garwood, N.J., can be ordered from Techni-Kits, 350 Broadway, New York, N.Y. A complete kit No. 105 containing all parts needed to build the unit is also available for \$6.50 without battery or microphone. The microphone can be ordered separately, however.

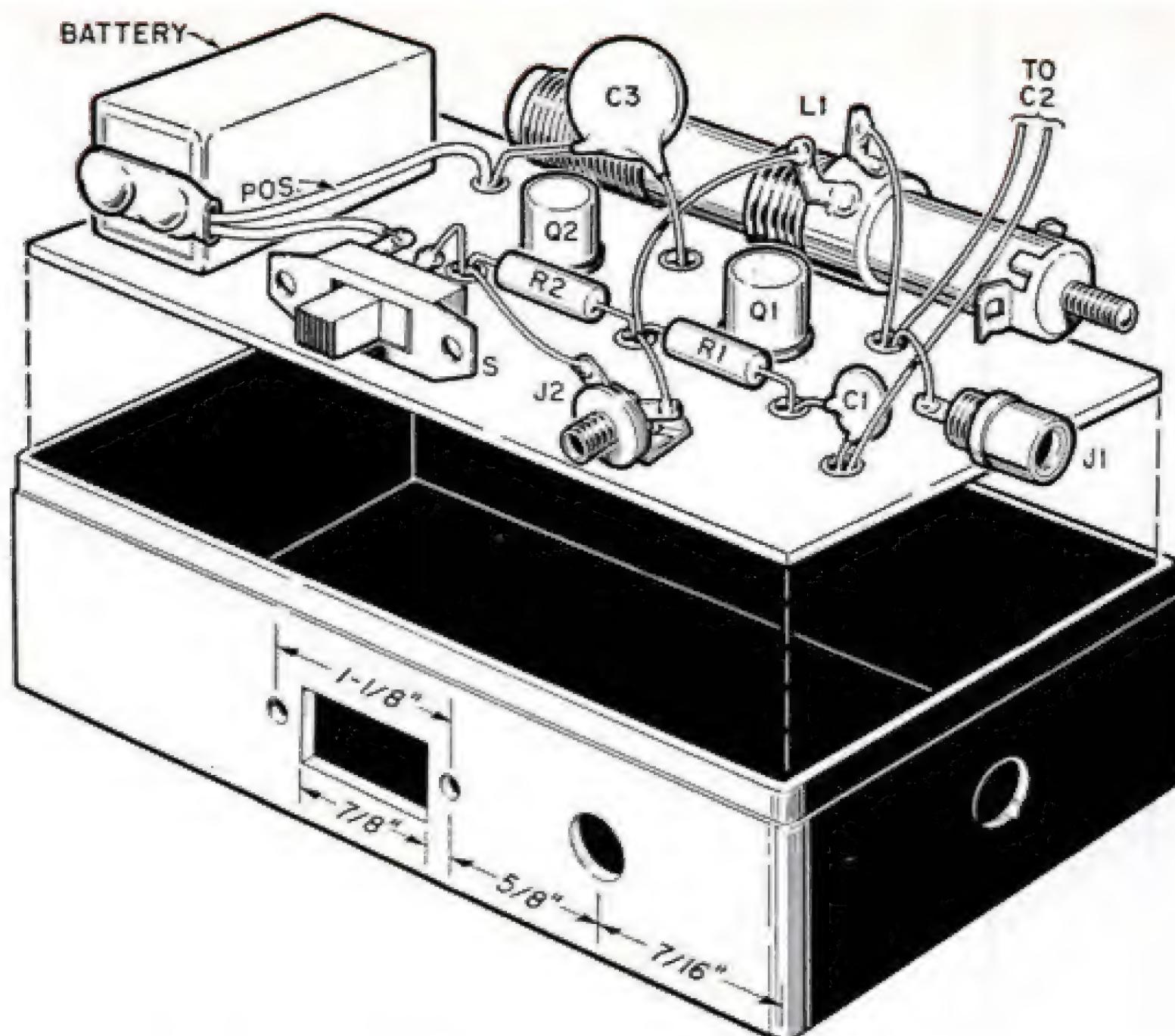


**THIS UNIT SHOULD DO** until microelectronics technology puts an amplifier inside a guitar pick!

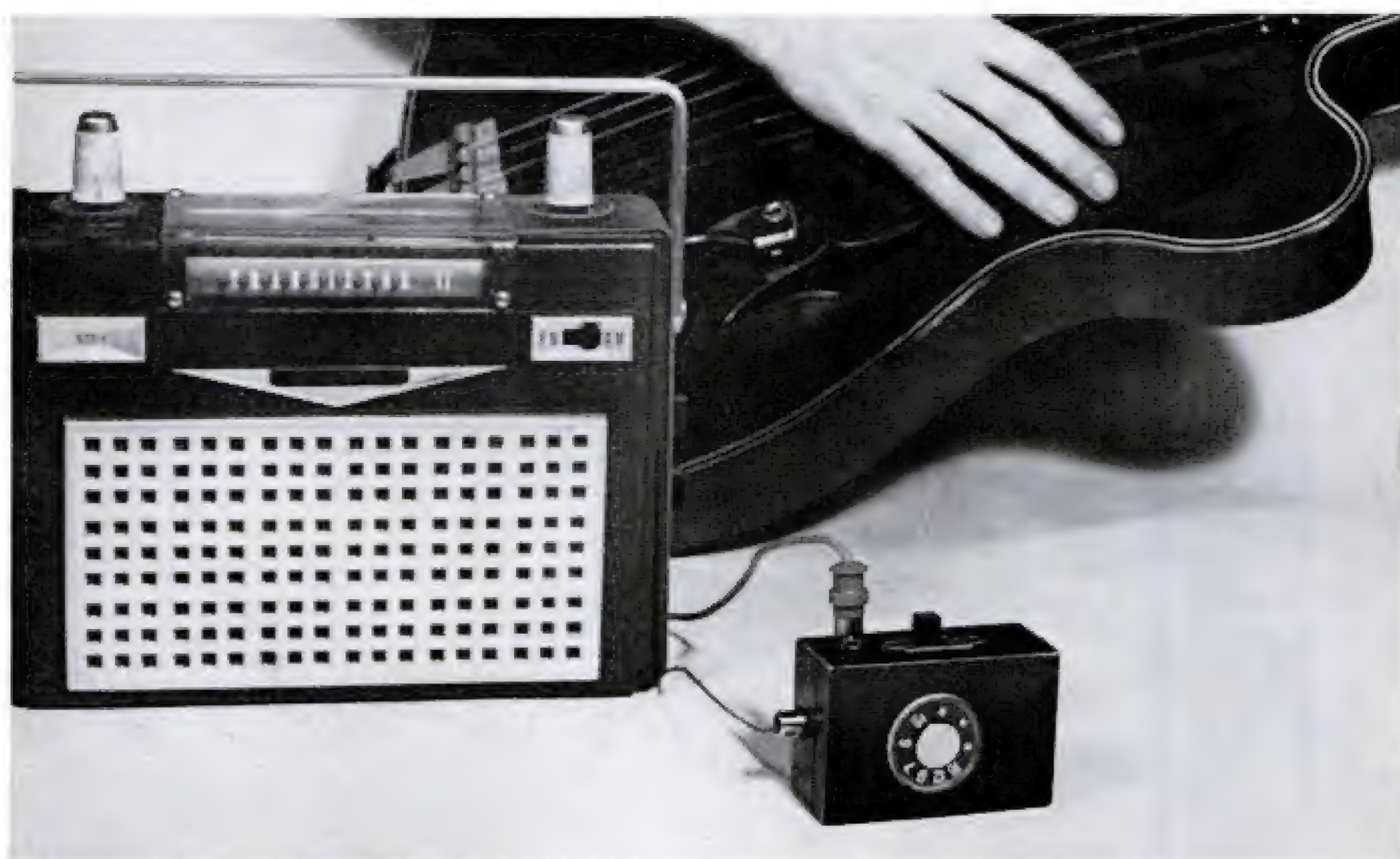


**MIKE INPUT** of low-power broadcast band transmitter is through J2, rf output via ant. jack





**EXPLODED VIEW OF THE GUITAR AMPLIFIER** shows construction details. The plastic chassis case must be cut as shown to receive jacks J1 and J2 and the on-off switch. Case front, not shown, is drilled for C2 shaft



**THE MIKE IS CLIPPED TO YOUR GUITAR** and then plugged into J2; the antenna from J1 is placed near the AM radio and both radio and transmitter are turned on and tuned to a clear portion of the broadcast band



# Build a power-failure alarm

By CHARLES CARINGELLA



**A** POWER-FAILURE ALARM? Who needs it to tell him that his a.c. lines are dead? It's *usually* pretty obvious: you're plunged into darkness, your radio goes off, the TV picture shrinks to a little dot and disappears, or, at high noon, the electric mixer stops and you usually quickly realize what has happened. But, there are those times when you can actually be unaware of a complete or partial blackout. A blown fuse or tripped circuit breaker can disrupt power in one branch of your house wiring. If it happens to be the branch that powers the freezer, you won't know it until you lift the lid and find ice cream soup.

Most of us depend on electric clocks or clock radios to wake us in the morning. If a power failure occurs in the middle of the night, the electric clocks become



useless, and you—happily or unhappily, as the case may be—snooze halfway to noon. This is when a power-failure alarm proves indispensable in your home. It acts as a “wake-up” alarm for power failures that occur in the night, and it alerts you to take steps, if possible, to safeguard perishables in the refrigerator and especially in the freezer where you may have a considerable investment in frozen foods.

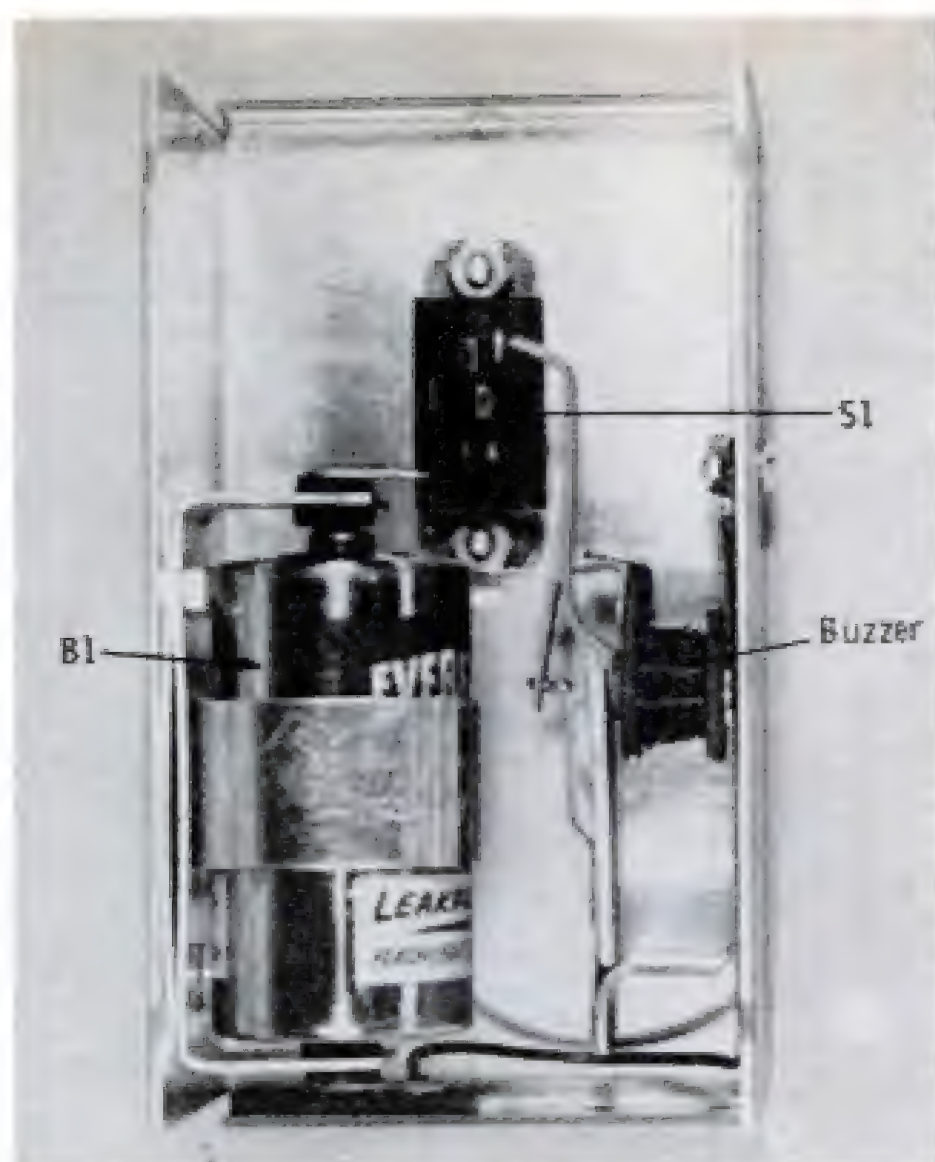
You can build a simple, inexpensive power-failure alarm with just a handful of parts that add up to about four dollars. It's a self-contained unit that plugs directly into any a.c. outlet. An internal battery provides standby power for the warning buzzer, which actuates the moment power is lost in the a.c. line.

As seen in the schematic diagram, the circuit is extremely simple. A thermal-delay relay is used as the power-sensing device. The delay feature of the relay is insignificant here. The thermal-delay type relay is used because of its low cost as compared to conventional a.c. relays.

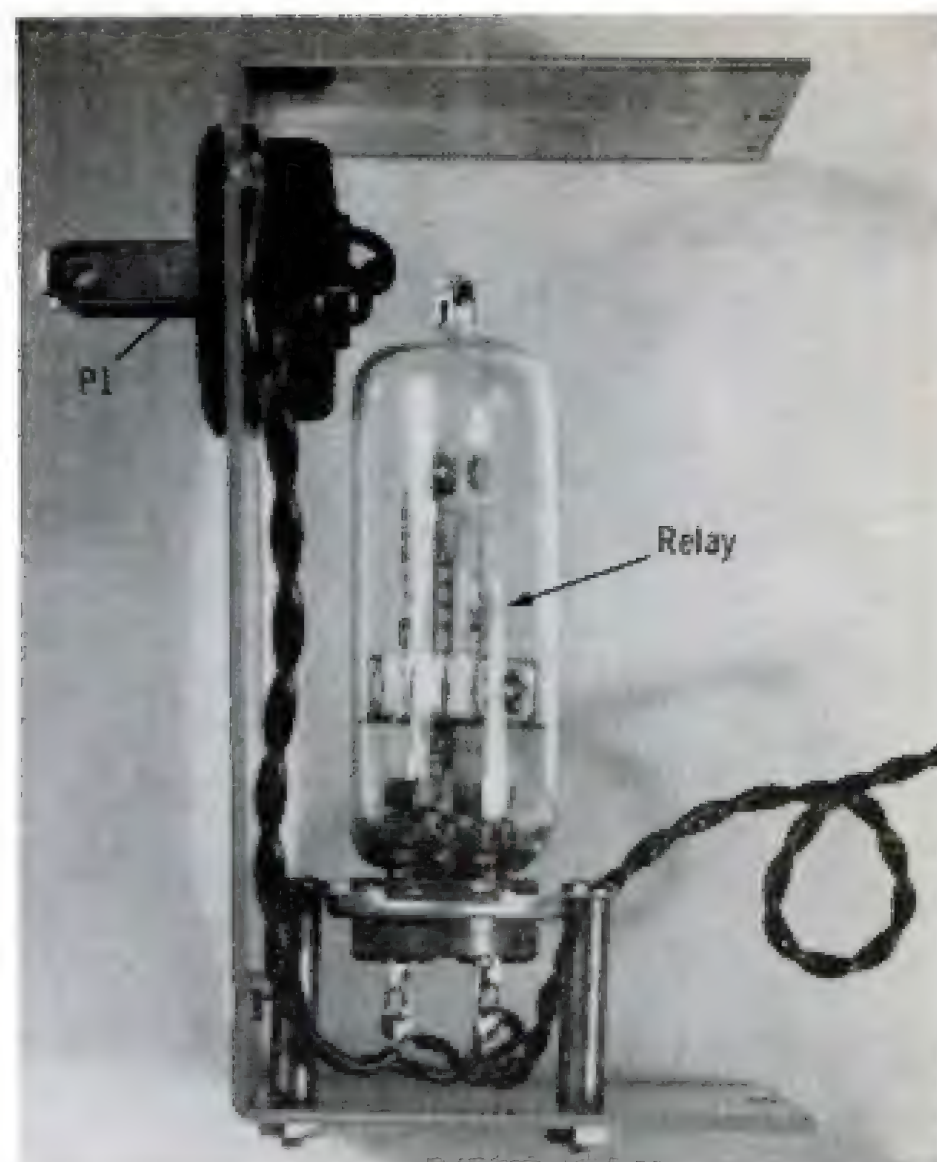
The relay is packaged in a small 9-pin glass enclosure, similar to a 9-pin miniature vacuum tube. Internally, the thermal relay consists of a small heater and a set of bimetal contacts. When current flows through the heater, the contacts either open or close, depending on the contact configuration.

A thermal-delay relay with normally closed contacts was chosen for this application. The contacts are normally closed when no power is applied to the relay's





**SWITCH S1**, which disconnects buzzer from battery B1 when the alarm is unplugged, mounts on front cover



**MOUNT P1** near top of back cover so top receptacle of the wall outlet is left clear when alarm is in use

internal heater. When power is applied to the heater, the contacts open and remain open until power is removed. The specified relay utilizes a 115-volt heater. In the power-failure alarm, the heater circuit is applied directly across the 115-volt a.c. line. As long as power is present in the a.c. line, the heater is kept in an energized state, and the contacts remain open. The heater, incidentally, consumes only two watts of power, less than that needed to operate most night lights.

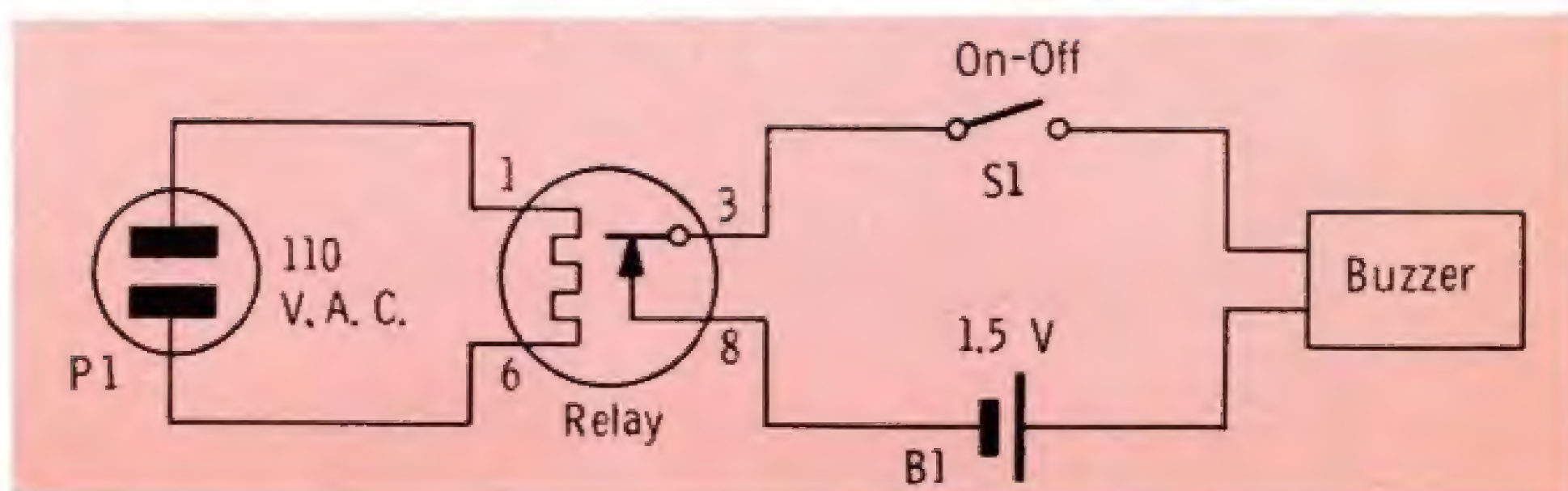
A simple battery operated buzzer circuit is connected to the thermal-relay contacts. The moment power is lost in the a.c. line, the relay contacts close, and the buzzer is activated. No power is drawn from the battery until an actual power failure occurs, therefore battery life should be equivalent to its shelf life. A 1.5-volt battery and buzzer are used here, al-

though a six-volt battery arrangement can be used with a six-volt buzzer if you've got one in the scrap box.

Switch S1 turns the buzzer on and off. It can be used to turn the buzzer off when the unit is unplugged from the a.c. line for routine testing and servicing or during a power failure. As far as testing is concerned, the alarm buzzer has another good use—checking power at various a.c. outlets while you label your fuse or circuit breaker box. It's a quick job and once you've finished, you'll put an end to the confusion of wondering which fuse protects what circuit.

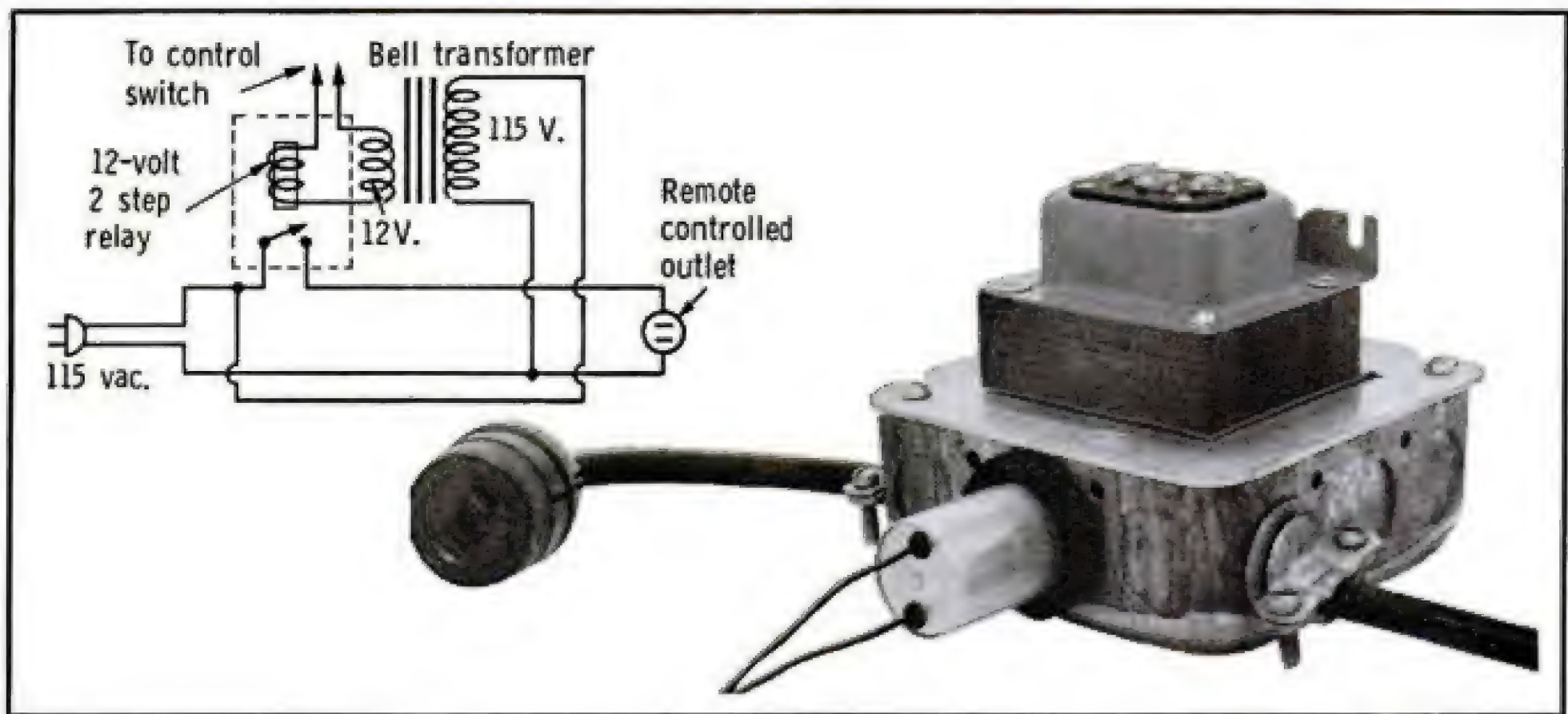
Mount the tube socket on  $\frac{3}{4}$ -in. spacers. Commercially available spacers are available and called out in the parts list. Suitable homemade spacers can be manufactured from  $\frac{1}{4}$ -in. brass or aluminum

*(Please turn to page 216)*





# ELECTRONIC KINKS



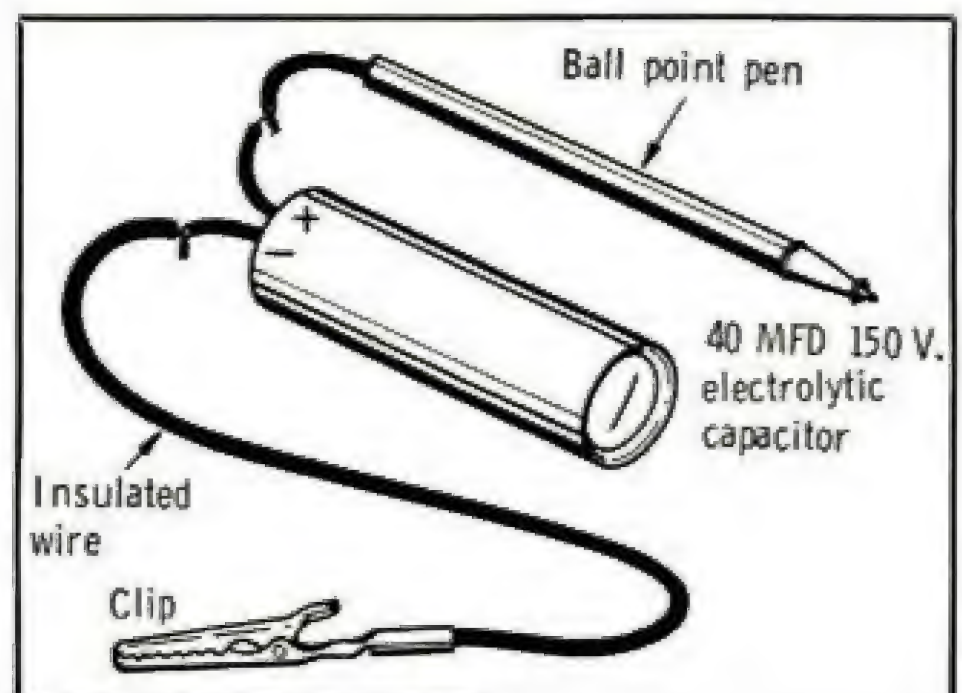
**Remote power switch.** Here's a simple way to control an a.c. outlet from some distant point. All parts mount in a single 4-in. electrical terminal box. The step relay turns the circuit on or off each time the control switch is closed. Since the con-

trol circuit carries only 12 v., bell wire can be used and the switch can be located anywhere in the house. The controlled device—a front porch lamp, for example—is plugged into the controlled outlet.

—Joseph Braunstein



**Polarized extension cord.** You can make your own polarized extension cord in minutes for use with any transformerless a.c.-powered device that must be properly grounded. Any ordinary plug and socket will do, but flatten one plug prong to polarize it. Widen the corresponding socket slot to match. Now hook up the desired length of zip cord making certain that the wire connected to the wider prong connects to the wider slot.



**Quick capacitor tester.** An old ball-point pen, 40-mfd. electrolytic capacitor, alligator clip and length of wire are the elements of this handy gadget. Connect the positive end of the capacitor to the center pen barrel and the negative end to the wire. Then attach the clip at the end of the wire and tape the capacitor to the side of the pen.

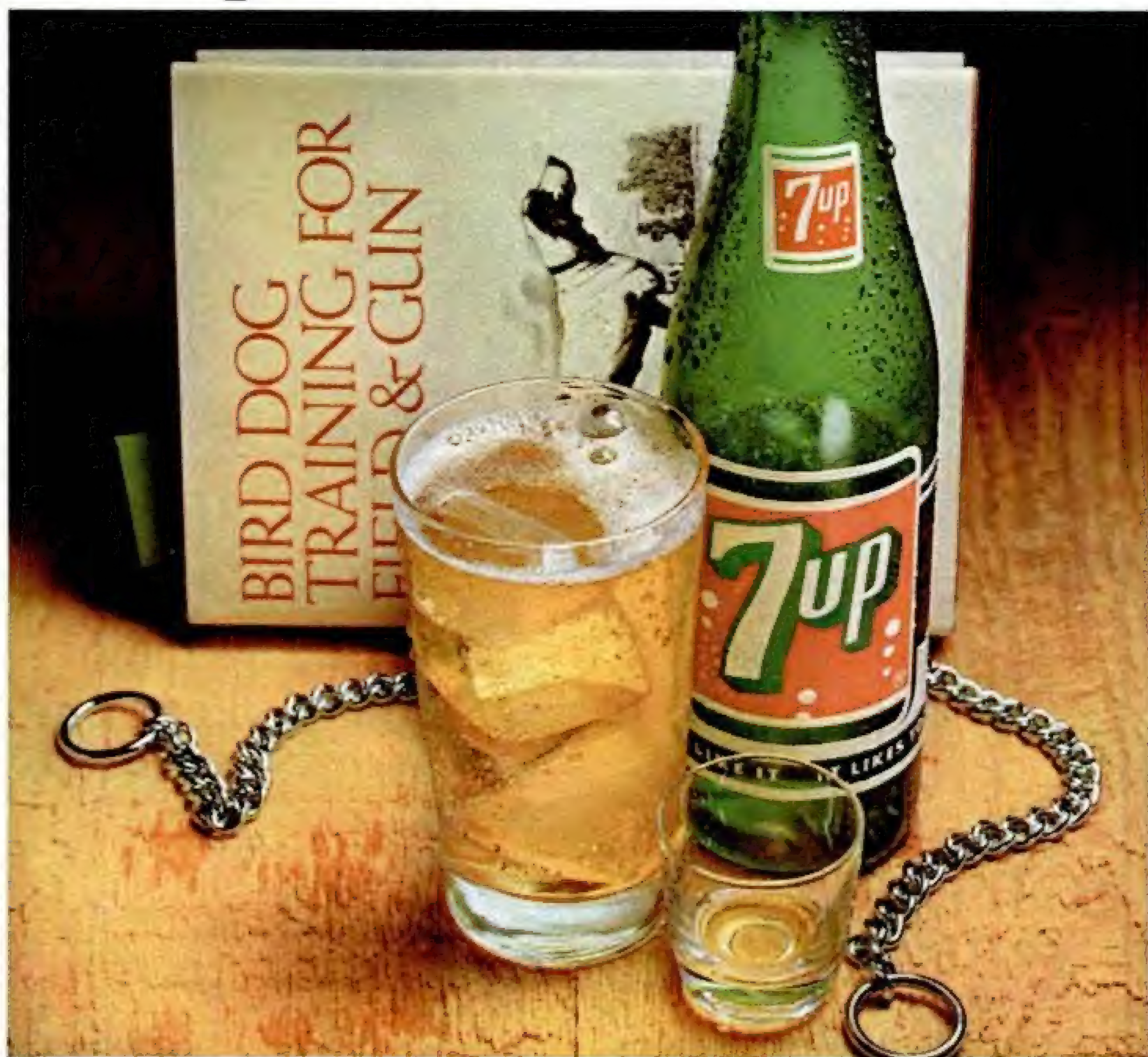
To use the tester connect the clip to the chassis of the set you are working on and touch the pen tip to the capacitor contacts. If the set works normally again, you know the capacitor is bad.





Good dog. Staunch on point. Steady to wing and shot. Call it a day. He gets a good brushing. You get a 7-Up and bourbon or gin or vodka. Or whatever you can scare up. It's a man's mixer in more ways than one. Seven-Up. The one you never outgrow.

# 7-Up. the man's mixer







**This is a GM Original:  
It shrugs off electrical wallops.**



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**Like a giant beach ball,** a 53-foot plastic radome housing perches on the deck of the *Kingsport*. The ship is the world's first satellite communications ship; inside the dome is a 30-foot antenna that's used in conjunction with high-altitude hovering satellites.



**Checking for lethal indigestion,** a British soldier in the Aden Protectorate goes over a camel with a mine detector. It has become common practice for terrorists to force-feed camels with small arms and detonators to smuggle them into the country for use against the British.



**Three eyes for a space observer.** This three-camera television system was designed for "Nimbus," NASA's experimental weather satellite. Built by the Astro-Electronics Division of RCA, the cameras will cover a path 2000 miles wide, taking 12,000 pictures of the earth's surface and cloud formations each day from an altitude of 600 miles.





by Ford  
America's newest  
luxury car



## Ride Ford's New Wave for '67

Ford likes to stir up better ideas, like an LTD that rode quieter than a Rolls-Royce, and the Mustang revolution. But, even for Ford, these '67's are big news. The goal was a car as free from



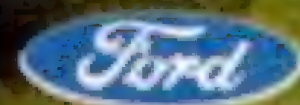
## '67 Mustang!

How do you improve a modern classic? Slowly, and with care. That's why Mustang for '67 is still Mustang only more so with a wider tread for better road holding, even racier body, and a bigger selection of engines from 200-Cubic-Inch Six to 390 V-8.

Mustang Hardtop



*You're ahead in a Ford*



LTD 2-Door Hardtop with New Landau Roof

care at 50,000 miles as recent Fords were at 25,000 miles. To make this possible Ford engineers had to refine and strengthen more than 100 parts in key areas such as engine, frame, suspensions,

brakes, transmission. Result: one of the world's quietest rides, and more precise handling. And greater smoothness from engines that range from the Big Six to a 428-cubic inch V-8. See the

wave of new ideas that make Ford one of America's newest luxury cars. *And every 1967 Ford car has the Ford Motor Company Lifeguard Design safety features as standard equipment.*



## '67 Fairlane!

Big-car performance in a lean, agile car. Like this Fairlane 500XL 2-Door Hardtop. And big-car options like front disc brakes, Stereo Tape... without big-car price.

## '67 Falcon!

New luxury... with almost every option offered on our big cars. Like this '67 Falcon Futura Sports Coupe. If it wasn't so strong on savings, you'd call it a short limousine!



# FORD

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**Blow up an airplane.** That's what you have to do with the Puffin to get it to fly. The blowing up is done with air, of course (photo at left shows the craft partly inflated), and once it's filled with air, it'll fly 60 mph for 2½ hours. The delta wing is made of rubberized fabric; the wood fuselage is attached to it with straps and toggles. Deflated, the British plane can be carried in a small truck, since it weighs only about 500 pounds. Intended for use by military and civil authorities in areas where transportation is limited by difficult terrain, the inflatable aircraft is light and needs very little runway for takeoff. Inflation of the wing with a compressor takes about 30 minutes.



**100-yard toss** of a life-line is easily and accurately done with a cartridge-actuated thrower. When the Life Liner is fired, a 22-cal. blank cartridge will propel either a two-ounce or four-ounce line carrier plus 300 feet of nylon line with accuracy enough to hit a window on the fifth floor of a building says the manufacturer. The Life Liner is made by the Remington Arms Company.





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**Steve offered to match his old bolt-action rifle against anything around. That's when I brought out my new Remington Model 700. Steve's down at our Remington dealer's now.**



It took just three minutes to make a 700 shooter out of Steve.

He was arguing that bolt-action rifles hadn't really improved since way back when . . . when I got down to cases on the Model 700.

I started with the bolt. Steve nodded with approval as I showed him the strongest action ever put in a rifle. How the cartridge head is surrounded by three overlapping rings of solid steel. So

that Remington can safely chamber the 700 for the most powerful, modern calibers. (Fourteen of 'em from 222 clear through 458.)

Then we talked accuracy. I said the Model 700 was tops . . . and I showed him why. The trigger pull is the crispest, cleanest ever given a factory big-game rifle. The action locks up like a bank vault. And the wood-to-metal fit is just about perfect.


By the time we got to looks, Steve was sold. He admired the 700's Monte Carlo stock and cheekpiece. He ran his fingers over the custom-checked American walnut wood, was impressed with the super-tough Du Pont RK-W "bowling-pin" finish.

Then he asked directions to the nearest Remington dealer's.

Darned if I hadn't forgotten to tell him the best feature of all: Model 700 prices start at just \$129.95\*.

Interested? See your Remington dealer or send for the free 1966 Remington catalog. (Address below.)

Remington Arms Company, Inc., Bridgeport, Conn. 06602. In Canada: Remington Arms of Canada Limited. \*Fair Trade retail prices in states having Fair Trade laws. Prices subject to change without notice.

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**The "1-UNIT" PLAN pays you \$52.50** per week actual cash (at the rate of \$7.50 a day) for every week you spend in the hospital due to accident or illness—as much as \$2,737.50 if you are hospitalized for a full year.

**"2-UNIT" PLAN pays you \$105.00** per week (at the rate of \$15.00 a day) for each week you are in the hospital—up to as much as \$5,475.00 a year.

**"3-UNIT" PLAN pays you \$157.50** per week (at the rate of \$22.50 a day) for each week you are in the hospital—up to a total of \$8,212.50 if you are hospitalized a full year. And best of all, no matter which Plan you choose, you get all these advantages:

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## ALASKAN GOLD RUSH

(Continued from page 151)

This summer Shell is continuing its seismic studies and from now on will take its core samples from an unanchored ship, using electronic equipment to stay over the hole while drilling. A sonic pile driver is being adapted to drive the coring pipe, and the rig will be able to penetrate 110 feet of material in 10 minutes.

So far Shell has spent half a million dollars on its gold venture and may spend another million and a half to complete its prospecting program.

Will this expensive gamble pay off?

A spokesman says "The values definitely show commercial possibilities." That's as far as Shell will commit itself, yet other companies in the same area have made some amazing estimates.

They suggest: if the submerged gravels average half a dollar in gold per cubic yard and if the average thickness of the gravels is 100 feet, then the gross recovery from one 5120-acre lease would be more than 300 tons of gold. Further, if recovery costs amount to 30 cents per cubic yard, the net profit from a single lease would be around \$150,000,000!

Even if you cut that figure in half, the prospect is glittering!

Still, there are a lot of unknowns. Much of the gravel is bound to be barren. On the other hand, pay streaks may occur at more than one depth. And no one knows, positively, what the recovery costs will be. Too, the ice-free season is short, from May into October. . . . or will it be best to blast the ice away for all-year production? And so on.

Drowned streambeds and beaches aren't the only likely areas for underwater gold. In at least one place it is lying on the shallow bottom, literally waiting to be picked up. This happens to be on a mining lease off Bluff, 60 miles east of Nome. Here John Novak and Milton Morgan of the Auric Offshore Mining Co. spent last summer developing their lease. The overburden is only a few inches thick and yet it assays at half a dollar a square yard. So far, 200 acres have been "proved up" for a possible yield of half a million dollars in gold.

Last year, working from a 35-foot amphibious craft, Auric used a self-propelled suction device to lift the sediment to the boat where it was run through sluice boxes. But the device reclaimed only about half the values and work was stopped. Auric spent all winter developing more efficient equipment.

Other companies are active, too. One of them is Ocean Science and Engineering,

Inc., headed by Willard Bascom, the original sparkplug of the Mohole project for drilling through the earth's crust. Bascom's group has been active in underwater prospecting for years. In one contract it took 6000 core samples of the sea bottom off southwest Africa with its ship "Rockeater," exploring for diamonds for De Beers. The corings indicated "many millions" of carats of gem-grade diamonds under the sea.

In Malayan waters the company has prospected extensively, and successfully, for placer tin. Ocean Science holds some 50,000 acres in underwater prospecting permits in Alaska and last summer did sample dredging and coring in some of its area. Willard Bascom reports that "we drilled about 75 holes and found at least traces of gold in every hole."

### Where are "missing" placers?

One thing that puzzles mining engineers is, where are the "missing" placers of southeastern Alaska? There are numerous rich gold mines along the coast. Normally, quantities of gold would have been washed from these deposits and carried down the streams. Yet little or no placer gold has been found. Have the glaciers ground the gold so fine that it has all washed out to sea? That's possible, yet nuggets have been taken from under glaciers. Has the missing gold been deposited in the deep channels of the Inland Passage? That's another possibility. In some of the channels the bottom consists of "gray mud and fine gold flakes." If this is where the missing gold has accumulated it may remain there for a long time. The costs of dredging in waters that are 500 to more than 1000 feet deep would be enormous.

Burl Cheely of Hawthorne, Calif., who manufactures "Gold Divers" portable underwater mining rigs for small operators, has shipped more than 30 of his units to Alaskan purchasers in the last few years. His patented suction outfits sell for from \$450 to \$3200. This summer he brought out a new small model priced at \$200. It is powered with a four-hp engine and has a one-and-a-half-inch suction tube.

Cheely figures that a grubstake of no more than \$505 plus a pickup truck and camping gear is enough for two men to prospect for placer gold—in California. What's the extra \$5 for? "That's to buy a book on how to seek gold," he says. "It's surprising how many people seriously go prospecting with no idea of *where* to look for gold or *how* to recover it."

Cheely would spend the rest of the money like this: \$200 for one of his new



suction outfits, \$100 for a good neoprene wet suit, face mask, regulator and weight belt, to be worn by the man who guides the underwater suction hose. The rest of the money goes for gasoline and food. Scuba gear isn't needed because the underwater man gets his air from a compressor that runs off the pump engine.

Cheely cautions that the compressor must be of the oilless type to avoid respiratory infections, and that a good grade of breathing hose must be used. Garden hose sometimes has contaminants that can be toxic.

### You may need permission

The estimate of \$505 definitely doesn't apply to Alaska unless you already live there and know where to go. It's a long way up the Alcan highway, gasoline is expensive and food costs are high. One other thing: private property and existing mining claims can't be worked without permission.

And, always, a little "local knowledge" is a good thing. There's the case of the deep-thinking amateur from one of the original 48 states who arrived in Alaska with a brand-new and complete outfit.

"I figure," he announced, "to work the fastest waters of the streams, where the

current is so swift that no one has ever been able to get down to the cracks and crevices. With my outfit I can do it!"

An old-timer kindly explained to him that this problem had been solved more than six decades ago. Baffled by fast water, the early miners merely waited until winter had frozen the creeks solid and then they cut the ice away, all the way to bedrock. It's said that the amateur genius headed south without even unpacking.

Gold is the basis of international trade, and here the United States finds itself in a fix. Our stock of gold is down to a bare minimum and we desperately need more. Meanwhile, many domestic mines with plenty of gold blocked out underground have had to shut down because of rising production costs. One solution would be to increase the price of gold from its present arbitrary \$35 per ounce, but this inflationary move would upset world trade.

As another way out, the government may decide to pay a bonus to the shut-down mines to get them back into production at a profit.

With or without help like that, the new Alaska gold rush is happening just at the right time, just when Uncle Sam needs more of the yellow metal. ★★★

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## CHASSIS NOISE

*(Continued from page 186)*

for you to contend with.

**Wind noise.** Road-wind noise has become a problem in recent years because of the quantity of chrome strips used on most late-model cars. Some of the modern ventilating systems also become wind-sponsored noisemakers.

This latter problem may arise when a car is driven with the windows closed and the cowl ventilator opened. A certain amount of air-pressure buildup can take place inside the car that will tend to force the glass outward and imperceptibly lift the seals away from the windows. The result is that the air is often forced out around the seals with a pronounced hissing sound.

Tracking down and reducing or eliminating noises caused by road wind is a straight trial-and-error proposition. To pinpoint noise created by wind getting under the gaps in chrome molding becomes a matter of taping each strip of chrome in turn, then road testing the car to learn the results of each taping job. A permanent repair involves removing the offending strip, its back with automotive caulking compound, then reattaching it.

If wind noise persists, run masking tape along the outside edges of each window, then road test the car after each window is taped. When the noise stops, you know you've found the "leaking" window. Re-seal or replace the weatherstripping.

While you're at it, check the weatherstripping around the doors, resealing or replacing it as required.

**Chassis noise.** Often the cause of a body noise can be traced to a fault in the chassis—for example, loose or worn parts in the engine compartment, wheels that are out of alignment or a misaligned driveline. The trick, then, is to find out which of these elements is at fault.

A portable tachometer can aid in this search. Tie the tach into the engine, then lead the gauge into the car where you can view it while driving. Drive at the speed necessary to produce the noise, then note both the speedometer reading and the rpm registered on the tach.

At this point shift down to the next gear range and drive the car to again bring in the noise. If the noise now occurs at a lower car speed, but at the same engine rpm, you've tagged it as originating in the engine compartment. If the noise occurs at the same car speed but at a higher rpm, it is being created in the driveline or by the wheels.

Since space limitations prohibit a discussion of the many types of engine and

drive-line noises and their cures, we've provided a quickie check-chart (page 186) listing the most common causes and sources of noise in these areas. The chart may be your fastest noise locator.

**Dash noise.** Tracking down dash noise can be rough because of the jungle of parts located on, under and behind the dash. You'll again have to resort to the good old trial-and-error method—pushing, pulling, jiggling and tightening until the squeak or rattle is found.

Here, as elsewhere when seeking out a noise in the car, try to invest the search with a methodical, systematic approach. This will usually involve a process of elimination. Keep track of the parts and areas you've already checked so that you won't waste time going over the same ground twice. When you think you've found the trouble and fixed it, immediately road-test the car to determine if your "silent treatment" worked.

Remember, any car has the built-in capability of producing more noises than amateur night at a monkey farm. Each rattle and squeak, moan, groan and sigh is an entity unto itself; each must be separately bird-dogged and silenced. Keep at it, be patient, and your quiet car will return.

Oh yes—I almost forgot!—I never told you how we found the decibilibic devils in neat Ned Ames' gleaming coach. Seems old Ned had failed to properly seat the jack when he replaced it last time he cleaned out the trunk. It took us all of three seconds to chop the tail off that "rattler" . . . one swift kick seated it very nicely in place. ★ ★ ★

## Nuclear research to aid amputees

An off-shoot of nuclear research may help thousands who have suffered the loss of one or more limbs.

Tools used for long-distance handling of radioactive materials too "hot" for direct contact bear a close resemblance to the mechanical hooks currently used by many amputees. And it is through the "marriage" of these remote-control manipulators and modern prosthetic devices that Dr. E. V. Murphy of the Veterans Administration in New York finds the greatest hope for future improvements in devices for amputees.

Speaking to the American Nuclear Society, Dr. Murphy commented that the hook is vastly superior to the artificial hand in actual performance, and likened the difference to the advantage an airplane has over a flying device built to resemble a bird.



## ROCKWELL'S NEW 10-IN. SAW

(Continued from page 195)

stops at 90° and 45° right and left. Only the blade guard is an extra option. Although we always recommend the use of a guard for safety, I didn't find *this* guard one of the saw's better features. It's a fly-weight fiberglass hood that's rather flimsily bracketed to the pivoting motor mount. When folded back, the guard blocks any long passes, and when the fence is moved so close to the blade that the guard is useless, it's awkward to prop the guard up out of the way. For clarity of demonstration in several photos, I removed it entirely. The list price of the 34-301 is \$226.55.

You can buy the identical 10-incher without stand or extensions as Model 34-300; in this basic form, the saw lists for \$159.50. There's also a cheaper 9-in. version, powered by a 1¼-hp motor. This model lacks the table-top blade-tilt scale and comes with an economy miter gauge; the price: \$119.95 for the basic saw, or \$165.10 with table extensions and stand. Accessories for both 9- and 10-in. saws include molding cutter and dado heads. Rockwell warns against the use of any type of abrasive wheel on these machines. All Rockwell tools are covered by a guarantee that offers repair or replacement of any part that proves to be defective during normal use. They're pretty sure of that reputation. ★ ★ ★

## Dial-a-book library

A 120,000-volume library from which a student can select any book simply by dialing a number is now in use in the technical university of Delft in Holland.

Six dials are located in the catalogue area. When the student dials the number of the desired book, a lamp lights up over the specific rack as a sign to the library attendant, and the book number appears on a digital indicator. If the book is available, the attendant places it in a chute which delivers it to the loan desk. If the book is not there, this is indicated to the loan desk through a second button.

The system, which cost less than \$3000, took two years to install and has shortened the time to find a book from 40 minutes to an average of 16 seconds.

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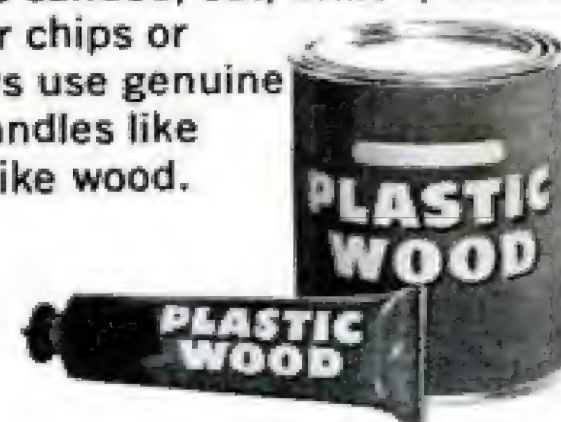
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## POWER-FAILURE ALARM

(Continued from page 201)

tubing. The buzzer mounts to the chassis with a single screw. One of the electrical connections to the buzzer is made to its frame; therefore, a solder lug should also be mounted under the screw used to hold down the buzzer. The lug provides a convenient connection point to the frame.

Both halves of the unit are wired separately. And two interconnecting leads are used. These are shown as the twisted pair in the back-cover photograph. The interconnecting leads run from pins 3 and 8 on the thermal-relay socket, in the back cover, to the battery and the on-off switch in the front cover.

The power-failure alarm is self-testing. Once the wiring has been completed, slip the C battery into its holder. Flip the switch to the on position. The unit should buzz loudly. Now, while the unit is still buzzing, plug it into an a.c. outlet. After two seconds, the relay should open and the buzzing should stop. The two-second delay, in this case, represents the delay time of the Amperite relay.

Just leave the power-failure alarm in the outlet; it's in operation. You can check the battery by simply unplugging the unit

and listening for the buzz.

★ ★ ★

### Parts List

- B1**—1.5-volt flashlight battery, size C
- P1**—Chassis mounting a.c. plug (Amphenol 61-M or equiv.)
- RLY**—Thermal-delay relay, normally closed contacts, 115-volt heater (Amperite 115C2T or equivalent)
- S1**—S.p.s.t. slide switch
- BUZZER**—1.5-volt a.c.-d.c. buzzer (CEI type 302, may be ordered directly from the manufacturer, C.E. Inc., Post Office Box 327, Upland, Calif. 91786, \$1.00 postpaid)
- Misc.**—Battery holder, C size (Keystone 173), chassis box (Bud CU-2103A or equiv.), 9-pin miniature tube socket, 2 spacers, 3/4" long (H.H. Smith 2373)

## POLE-LAMP TABLE

(Continued from from page 160)

disc. Use the bolts to insure that the brackets are lined up, and turn the bracket assembly so that it covers the holes made in attaching the faceplate. Finish the table to suit your taste.

To mount the table on the lamp, separate the pole sections and slip off the wire nuts to separate the wiring. If you have a pole-mounted switch on the lower section, dismount it, first attaching a thread to the knob so as not to lose it inside the pole. The table can be worked down over the thread. Slide the table down to arm-chair height and drill through the pole via the bolt holes, taking care not to catch the wires inside. Finally, bolt on the table.—Len Samuels

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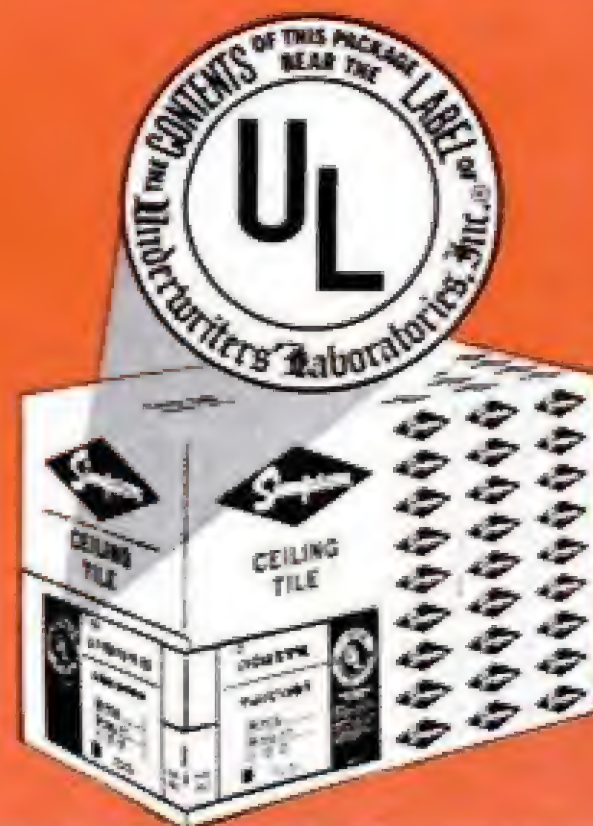
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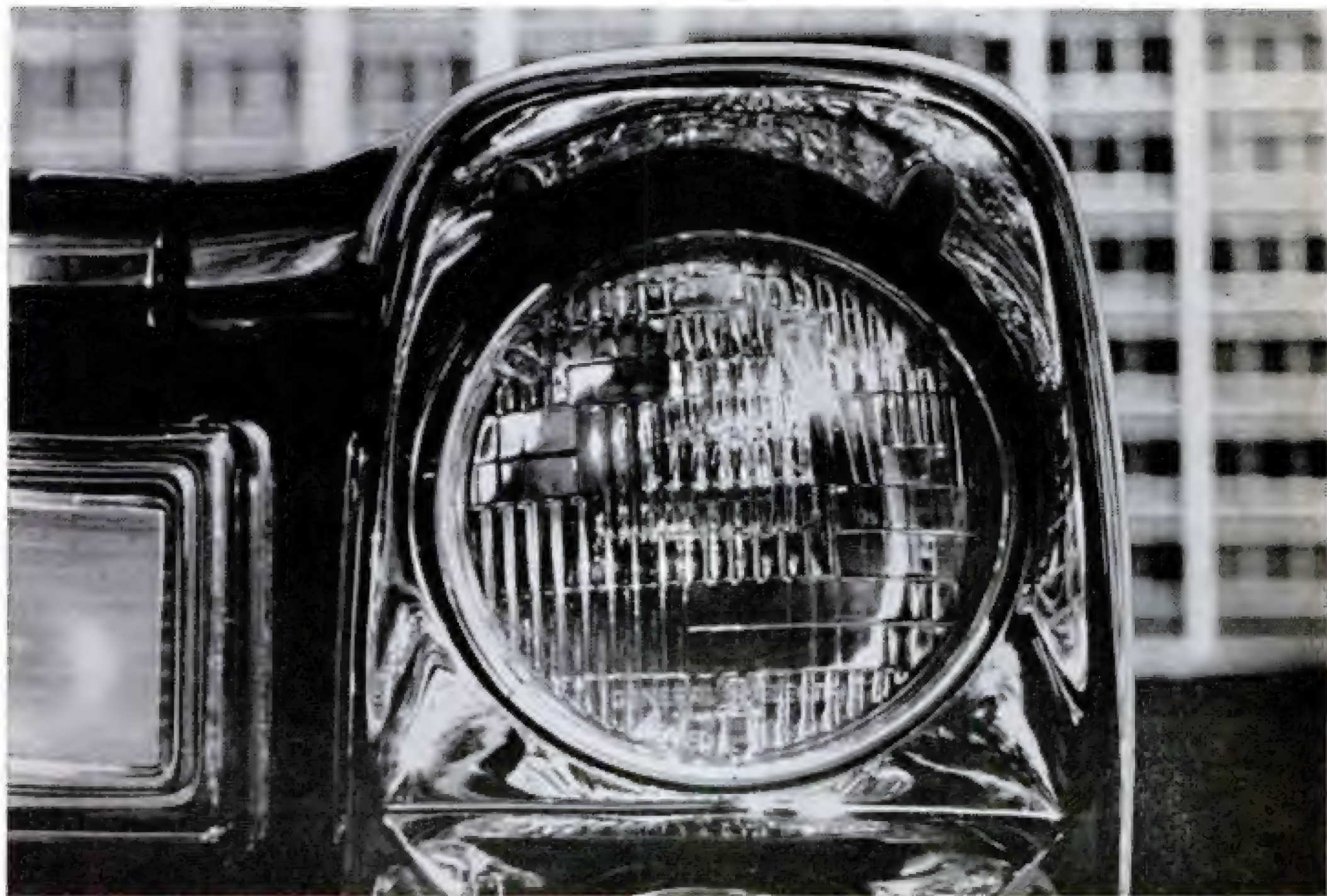
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## FREIGHT CARS

(Continued from page 141)

or 12 standard-size buggies? When he put the same question to Pullman-Standard, he found that plans for such were already being converted into a pilot model. Today, flotillas of the tri-decked transports have recaptured the long-haul auto trade. They are also making Detroit think twice before expanding regional assembly plants. For completed cars can now be shipped almost as cheaply as packaged parts.

Recently, the nation's largest producer of truck trailers—Fruehauf—collaborated with the Greenville Steel Car Co. in designing a piggyback job which eliminates the chore of shoving vans, tail foremost, over long strings of flatcars. Built-in turntables swing the trailers into alignment after they're loaded crosswise by tractors.

Even more sophisticated is a new ACF Industries' covered hopper. Normally, dry-bulk commodities are first transferred from railroad equipment to track-side storage bins, then onto trucks for local delivery. But with the ingenious "center-flo" design there's no intermediate handling.

### Like a hungry calf

The 100-tonners rumble onto any siding. Then a 20-ton tank truck nuzzles up like a hungry calf. The driver couples two hoses to one of the hopper's five compartments. Next he starts a compressor. Air rushes through one of the lines to a valve which shoots the greater part of it to the top of the sealed chamber. The rest is reduced in pressure, and driven into the base of the same container through millions of tiny holes in its discharge chute. Result: the payload is forced downward, but prevented from compacting. Behaving like water, it flows through the second hose and into the tank truck.

Old "gee-whiz" models which never quite made the grade are also being reworked. As early as 1850 a little pike called the Camden & Amboy tried serving its shippers with sealed boxes lashed to flatcar decks. The same idea looked good to a number of major roads in the 1930s. But containerizing, as practiced then, called for terminals cluttered with as many traveling cranes as the Liverpool docks. Now, flyweight aluminum alloys and husky fork trucks have changed the picture. Long "I" beams on wheels bear up to 20 cubes of merchandise, stacked two levels high. Still, you can't spot a fork truck on every siding. So one railroad, the Southern Pacific, has come up with "liqui-bin" cars which discharge and pick up five-ton drums with their own retractable gantries. ★ ★ ★

## GUITAR AMPLIFIER

(Continued from page 198)

guitar amplifier along with you on your next outing.

Let's take a look at the circuit of this little transmitter and see how it works. Two transistors are used. Transistor Q2 and its accompanying components form the audio circuit. Transistor Q1 and its associated parts form the radio-frequency oscillator. The signal picked up by the microphone clipped to the guitar is fed to input jack J2 and across resistor R2. Transistor Q2 amplifies the audio signal while transistor Q1 provides the rf component. The frequency of the rf signal is tuneable within the broadcast band using variable capacitor C2. The transmitted signal is picked up on the standard AM radio band by any nearby transistor radio you want to use.

### Build your transmitter

To get started you'll need a piece of cardboard or perforated phenolic board to use as your chassis. Refer to the pictorial diagram for the correct parts arrangement. The wiring shown in dotted lines runs *under* the chassis. Eyelets are used as terminal points to connect wires together. Mount all parts on the chassis and solder all connections. Next mount the two jacks and the switch on the plastic case. Now insert the chassis into the case and make the remaining connections from the chassis to the switch, jacks, battery, and to variable capacitor C2 which is mounted on the front of the case.

After completing the unit, hook up the antenna. It should be no longer than six feet. A longer length of antenna could put out a signal too strong to remain within the FCC rules and regulations covering this type of transmitter.

Now turn the transmitter on and while you pluck out some pop or folk tune have a buddy adjust the transmitter and AM radio tuning to bring in the guitar. It helps to tune the radio first to a blank spot on the band. Then tune the transmitter until you hear it from the radio. Tune for the loudest, clearest signal. Your volume limit is now only limited by the loudest you can play your radio. Incidentally, an AM tuner and high-fidelity amplifier also make a good receiver and with the high-power amplifiers currently being manufactured, you'll get more volume than you can stand.

Have fun and open a new dimension of portability and swinging sound in your guitar playing! ★ ★ ★



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# The Whole Town's on Stilts

By M. J. Pedersen

THE "IN" GROUP is the up group in the little south German village of Hagenbüchach, where everyone has taken to walking on stilts.

Heedless of age or gender, this elevated activity numbers among its faddists both the *kinder* and the simply *kindlich* of the townsfolk. At this stage, no one knows why the craze sprang or where it will end, but most groundlings are taking it in their stride. Local wood-merchants are delighted.



**MOTHER REDISCOVERS** that "a spoonful of sugar makes the medicine go down." In this case, stilts apparently have transformed dusting drudgery into fun



**WINDOW CLEANING** can even be a sport—when you have a good sense of balance and a pair of stilts. What's more, there's no ladder to tote around



**WHETHER TO CONSERVE** on shoe soles or for some other mysterious reason, practically the whole town of Hagenbuch, Germany, has taken to stilts for ambulation



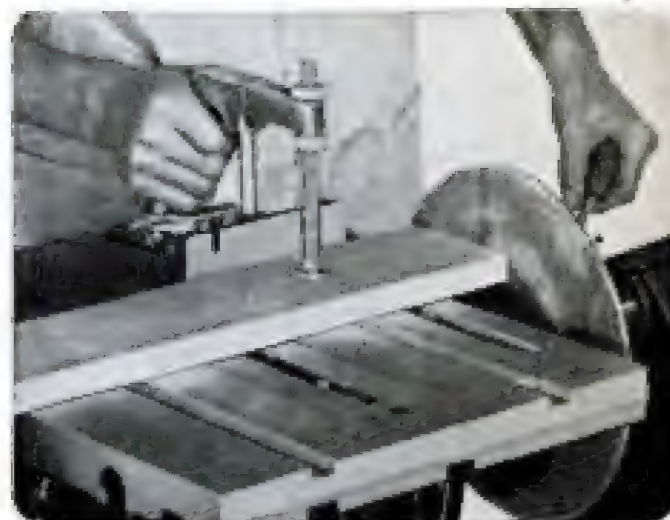
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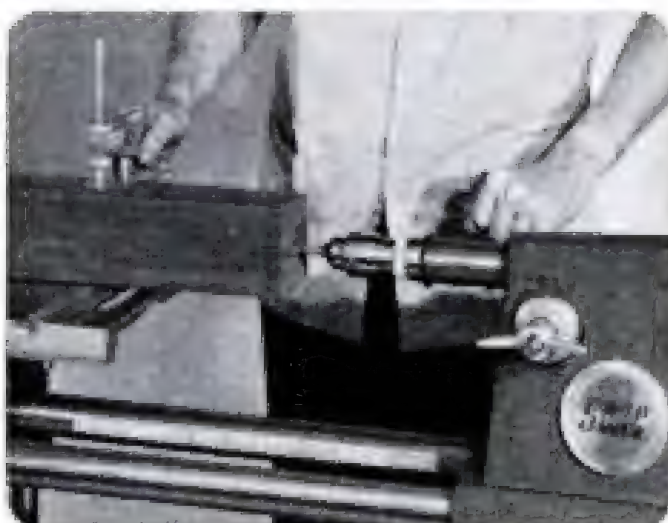
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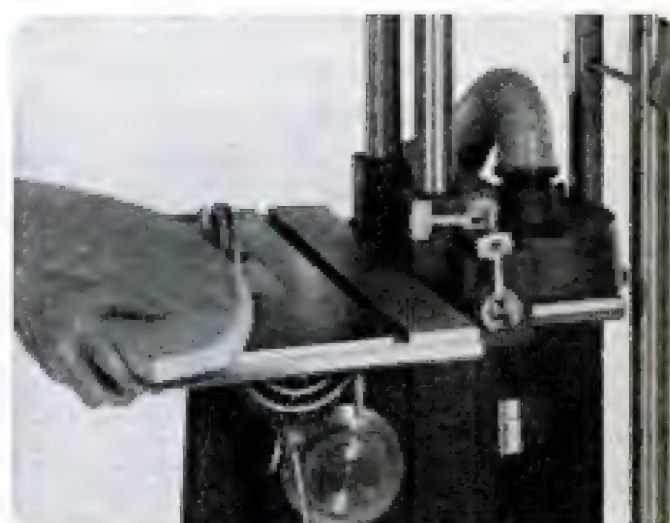
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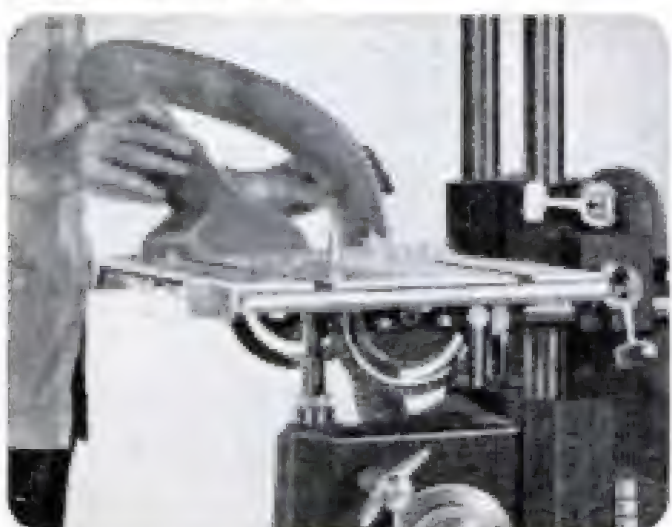
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## HAND GRINDER

(Continued from page 179)

The secret of success when using a hand grinder is a delicate touch. Abrasive tools, rotary files and the like depend on high rpm to produce a smooth, rapid cutting action. Take many light cuts rather than a few heavy ones. Applying excessive pressure to the tool slows the motor and reduces the cutting effect. It's also likely to result in chatter and a roughened surface. If prolonged, it may damage the motor.

As with any other tool, observe common sense precautions when working with a hand grinder. Don't use abrasive wheels, rotary files, etc., of greater diameter than those recommended by the manufacturer. Be sure the motor is properly grounded, especially if you're using it outdoors or under wet conditions (ground wire cords and plugs usually are provided).

Wear safety goggles or a face mask when using wire brushes, abrasive points or anything else which might throw particles toward your face. If you're sensitive to dust, put on a respirator when sanding, grinding or rotary filing.

All in all, a hand grinder can put new skills at your fingertips. With it you can do everything from sawing plastic to slitting hardened steel. Not bad for a bantam-weight. ★ ★ ★

## Bats are cave bound

In Trinidad, a tropical bat, *Phyllostomus hastatus*, has been setting world records for finding his way home at night. The bats' homing ability was checked by taking marked bats to specified distances from their home caves, then releasing them and clocking their time of arrival back.

In one night, 34 out of 74 bats returned from three to six miles away; 146 out of 257 returned from 7 to 21 miles; and 29 out of 112 from 25 to 33 miles. Although none of the 50 bats returned home during the first night from a distance of 39 to 40 miles, six did so over the next few days.

Like other members of the bat family, the *P. hastatus* bats navigate mainly by a system of echolocation, a sort of radar that enables them to find their way in the dark or when blindfolded.

## Water wings for Jeeps

Jeeps and other Army vehicles can now "swim" water obstacles with rubberized nylon bags which inflate from the exhaust of the motor. The vehicle can then float, propelled only by the action of its tires in the water at more than three miles per hour. Front wheels act as rudders.





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### Climate divided africans

Some 60,000 or 70,000 years ago, a cool dry climate spread over the African Sahara, breaking up long-standing prehistoric settlements called Acheulian and dividing people to the north and south.

Until the middle Pleistocene (glacial) age, the Sahara, with its abundance of water, had favored Acheulian hunting life. But water became scarce, vegetation changed and people moved.

It was at this point, believes anthropologist J. Desmond Clark of the University of California, Berkeley, that Africa man began to separate into distinct cultural and physical groupings. Hence today, we find Mediterranean people in North Africa and basic Negro stock in South Africa.

### Sugar-cured ulcers

Common granulated sugar has been used to cure 41 of 49 skin tissue ulcers

among patients at Glenn Dale Hospital in Washington, D.C.

Dr. James W. Barnes, Jr., who exhibited photographic proof of his cures at the Annual Scientific Assembly of the Medical Society of D.C., explains the process: "The way sugar works is to form a counter-irritation, so the original wound is changed. It appears to initiate wound repair by causing 'local injury' and be a stimulus for granulation tissue formation."

"However," said the physician, "prevention is still better than cure, and we are spraying silicone on other parts of the bodies of our patients to prevent further ulcers from forming."

### Backward growth

Bonefish grow by shrinking. When the young fish reach about three inches, they actually shrink an inch or two before resuming growth to attain full length of about 36 inches.



## THE INTERMEDIATES

(Continued from page 120)

gine, the only one available in the G.S. and not available on any other car in the Buick line. It's the "440-4," 340-hp unit, known last year as the 325-hp Wildcat 445. That "445" stood for torque, of all things. This year all rocker arm covers will be decal'd with displacement and number of barrels to end the confusion.

**CHEVELLE:** Continuing with its "luxury" Caprice series philosophy, Chevrolet is introducing the Concours at the top of its Chevelle line. It's a four-door, two-seat wagon boosted in price by the addition of exterior wood-grain trim and luxury embellishments in the Caprice vein. It will sport either an L-6 or V8 engine. The L-6, standard engine in the Chevelle line, is 230 cu. in. with a bigger 250 cu. in. also available; hp difference is 15.

**DODGE CORONET:** Dodge letters for '67 are R,S,T and E in this order: R/T for the "Road and Track" version of the basic Coronet, SE for the "Special Edition" of the Coronet. The SE is simply a luxury option typical of those enjoying growing popularity with the motorist who wants more flash in a medium-priced car. The R/T, however, is something else. Equipped with the new 440-cu.-in. "Magnum" engine, associated hardware and 150-mph speedometer, it should have been designated the T/R.

The half-year-old Charger includes the 440 Magnum as an option, also the Hemi. Both engines constitute the high-performance power packages. The "mother-in-law seat" interior option fills that space between the front buckets and should be the envy of all those—mothers-in-law or otherwise—who've ridden the center console in a literal pinch.

**FAIRLANE:** Fairlane series designations haven't gone any further up the alphabet this year; GT and XL are still the sport versions of the basic Fairlane and Fairlane 500. As in '66, all sports models feature racing stripes and external paraphernalia that characterize the typical high-performance and handling car.

New on the line with 289-V8 or 200-6 engines will be a "tuned dynamic absorber" to dampen noise and vibration originating in the drive train and normally transmitted through the car. It's a simple weight device with a predetermined natural frequency that's attached to the transmission housing extension.

**COMET:** Mercury has been too busy weaning the young Cougar from the mother plant to devote much time to any radical changes in its Comet lineup. The

202, Capri, Caliente, Cyclone and Cyclone GT styling has been only slightly retouched. Mechanically—aside from the industry-wide safety additions for '67—the "improvements" are the run-of-the-mill modifications and revisions.

The 427-cu.-in. engine, incidentally, is a limited production option on two-door sedans and two-door hardtops only. The 11.1:1 engine is rated at 410 and 425 hp with single 4-bbl. and dual 4-bbl. carburetors, respectively.

**OLDSMOBILE:** The Olds middle-size lineup still reads F-85, Cutlass, Cutlass Supreme and 4-4-2. The 4-4-2 is, as last year, the special package available on Cutlass Supreme coupes and convertibles. Oldsmobile's emphasis in this "low price market" is on the new options for '67. The options—to concentrate on the 4-4-2 specifically—fall square in the performance category. There's front disc brakes, a three-speed Turbo Hydra-Matic transmission that replaces the two-speed Jet-away, Firestone F-70 wide oval tires with red or white stripe, and specific rear-axle assemblies.

**PLYMOUTH BELVEDERE:** The Belvedere 1967 series has been expanded by two new models—specifically, the high performance GTX and a two-seat station wagon. Description of the GTX "tweedledee" can be easily confused with Dodge's R/T "tweedledum." The Hemi engine is available in both, as is the 440 cubic incher. In the GTX it's called the "Super Commando V8." The successful Satellite continues with few changes from last year. With the 426 Hemi option, it should remain a track favorite.

**TEMPEST:** Back on the subject of options and accessories once again, we should mention one that you'll probably be seeing on Tempests, LeMans, and GTOs. It'll be hard to believe, but that lump on the hood, just outside the windshield and ahead of the driver is a tachometer! As if the top-of-the-dash location, where most manufacturers mount their optional tachs, wasn't bad enough! Not being able to figure out the logic of the location, I've concluded that the engineering department couldn't figure out a way to bring a few leads through the firewall for a sensible instrument panel mounting.

A second and excellent option is a capacitor discharge ignition system that puts out a solid spark under any operating condition.

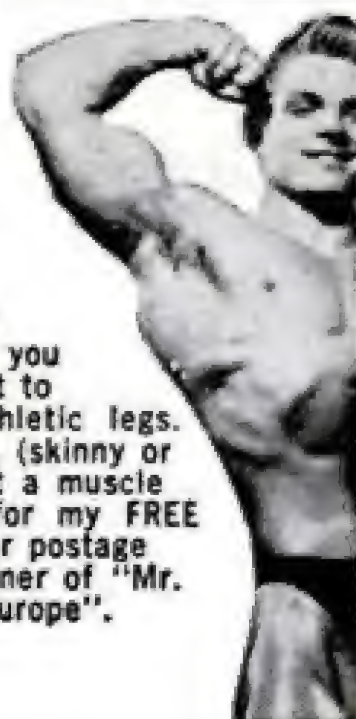
In Pontiac's intermediate line—otherwise conforming closely to that of '66—one change is the introduction of the Tempest Safari four-door station wagon as a separate series.—Bill Hartford



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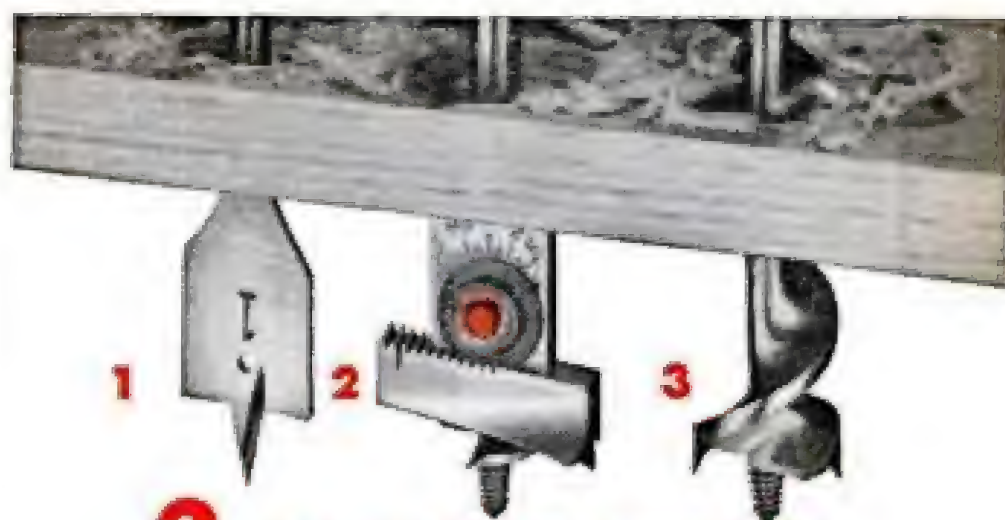
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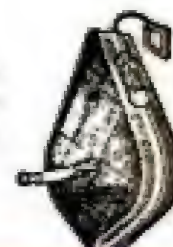
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## HOME "THEATER" WALL

*(Continued from page 169)*

control system—a panel of switches located on a wall near the host's chair, behind the audience. The use of low-voltage relay controls here saved many dollars by eliminating heavy-duty wiring.

The 5x14-ft. projection "closet" behind Baker's paneled screen partition is insulated with sheet urethane and with Barrett sound-deadening board. Since this sheet material is dark brown, it shouldn't be painted, as the natural surface tends to soak up any stray reflections.

While a regular plate-glass mirror will give a fairly sharp image, to avoid a "ghost" reflection from the front surface it's well worthwhile to spend the extra money for a front-surface mirror made especially for projection use. A similar situation prevails concerning the screen: The 1/4-in. plate glass polarized screen Baker used sells for about \$5 a square foot and not only gives a sharp image but also seals the screen opening against leakage of projection sound. If your budget is limited, you can buy a special rear-projection plastic screen, about 1/16 in. thick, which will give a good image but lacks the sound insulating quality.

The "brain" of the entire setup—the remote-control center—was devised for Baker by electronic engineer Stanley Goldstein and was fabricated by Line Electric and Industrial Timer, two New Jersey concerns. The sound coordination was by Andre Rahmer, the lighting coordination by Richard Dubé.

In the room shown, the first step in creating the theater wall was to erect a partition five feet from the existing wall, using 2x4s and standard framing techniques. If, of course, the room in which your "theater" is to be located has another room or a large closet adjacent but separated by a non-load-bearing wall, you can save any new construction by piercing it to install screen, speakers and the rest. The wall can then be faced with prefinished wood paneling.

With open framing, Baker used 3/4-in. teak-faced Weldwood plywood. Cutouts for the various units can be made in the panels before they're installed, or you can mount them whole and cut the openings with a saber saw after they're in place. The latter approach is particularly recommended in the case of the "built-in" color television, since the set rests on the floor and can simply be pushed against the back of the installed panel to mark the location of its cutout.

A similar procedure is possible with the openings for the stereo speakers, if you

make your cuts carefully. For continuity of grain pattern, you must save the cutout section to serve as the front panel of the pivoting units. The kerf made by a saber saw won't give the necessary clearance to permit the panels to pivot—the verticle edges of the opening must be beveled as shown in a sectional drawing at the bottom of page 168. It's wise to set the pivoting units in place to test clearance before you apply matching tape veneer to the exposed edges.

The wall heaters under the speakers are, of course, optional, and will be omitted if the room already has adequate heat.

Note that a special treatment was given the panel joints. This was to avoid any opening of cracks between butted panels due to settling or shrinkage. Mating edges were rabbeted at the back to lap a matching 1/4-in.-ply strip. This groovelike joint also adds character to the wall.

As the sketch and photos indicate, the ceiling track for the sliding panels is concealed by a cornice long enough to accommodate their full movement. In the installation shown, the track also appears to be recessed because of a suspension ceiling that butts against this cornice; this effect is not essential. The track should, however, be secured to an overhead joist.

### Panels trip switches

The details on page 169 show how the door travel is regulated: the two panels are anchored to opposite sides of an endless sprocket-driven roller chain by means of metal plates. The travel is halted by limit switches that are tripped as the panels reach their extreme positions.

Gathering so much heat-producing equipment into so small a space makes it a good idea to provide some sort of ventilation. Baker installed an exhaust fan in his "closet's" outside wall, and created an air intake by cutting a 12x20-in. hole near the bottom of the access door and making a louvered vent from matching wood.

You'll see, also, that a "finish" was provided for the wall at both the baseboard and ceiling by routing a 1/4-in.-deep rabbet to take strips of black satin Micarta. This rabbet is 2 in. wide at the top and 6 in. at the base, and it was cut by first slicing through the veneer layer with a sharp knife, then cutting away the waste with a mortising bit in a hand router. The laminate was attached with two coats of contact cement. This treatment matches that given the doors of the bar alcove, featured in last month's issue, since that alcove is at the other side of this same room.

The bottoms of the doors are grooved to fit over a T-shaped aluminum floor guide that comes with the hardware. ★ ★ ★





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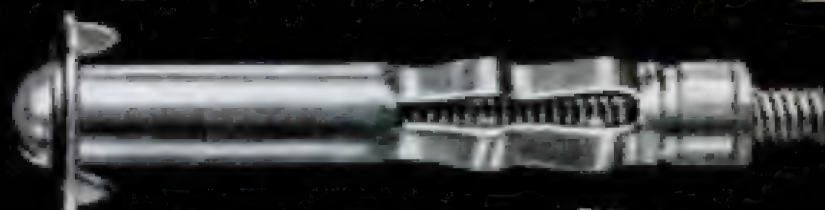
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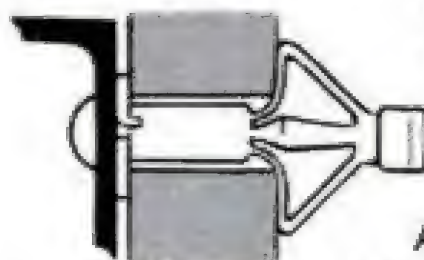
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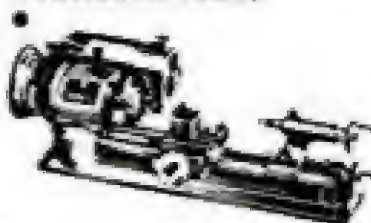
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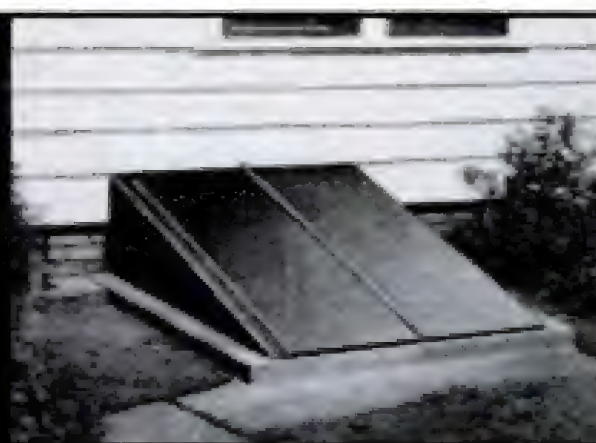
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## BUILT-IN CLOCKS

*(Continued from page 137)*

nights following the full moon in March, April, May and June, these smeltlike fish reach the beaches of California in a mating frenzy, timed exactly to the "highest high" spring tide. Girl smelts bury their eggs in the sand, and boy smelts fertilize them. The eggs remain relatively dry, developing and hatching, until a new "highest high" tide occurs under the influence of the moon. A wave washes high on the beach, barely snatches the little fry, and carries them back to sea to start a new life cycle.

The grunion, it is obvious, has a clock that somehow measures: 1. The passage of the Earth around the sun; 2. The passage of the moon around the Earth; 3. The revolution of the Earth upon its axis.

Particular beaches are important to the clocks of such tidal critters, for no two beaches have precisely the same tidal times. Fiddler crabs show a fine sensitivity to two rhythms: 1. A pigment in their skin (camouflage) gradually changes color on a precise 24-hour schedule; 2. Their feeding habits are timed to the tides, which follow a lunar-day schedule of 24.8 hours.

Prof. Brown took some fiddlers from their beaches and isolated them in a controlled lab environment. Did the crabs change their habits? They did not. Without any light or temperature clues, they kept changing color on a 24-hour schedule, and searched for food at exactly the same time as their cousins back home.

Or were there no clues? Prof. Brown began to suspect that the isolated crabs were sensing day and night, and even the phases of the moon, inside their laboratory tomb. They were getting secret information through the walls of the sealed box, some kind of signals that reset their clocks daily.

### **Influenced from outside?**

This is the kernel of the scientists' basic argument over biological clocks. One scientific camp says, in effect, that countless sealed-box experiments prove that biological clocks are "free-running," and are genetically implanted into every bit of life through eons of evolution. The other camp, following Prof. Brown's lead, says that they are not free-running, and that signals from the environment coordinate all clocks. In this view, all organisms—no matter how carefully entombed—are so incredibly sensitive that they can pick up timing clues from their environment.

Evidence for this view came in 1954, when Prof. Brown obtained some oysters

from a Connecticut beach and took them to his laboratory in Evanston, Ill., where he isolated them from any changes in temperature, light or barometric pressure. For about two weeks they opened their shells on "Connecticut tidal time." Then they shifted over to "Evanston-moon time." In other words, they had adapted themselves to what *would be* high tide in a city a thousand miles from any beach.

Obviously the oysters had somehow reset their clocks, and now were throbbing away on "lunar central time" instead of "Connecticut tidal time."

Countless experiments since then have indicated that the 24-hour biological clocks of most creatures can be reset by exposing them to a new 24-hour cycle of light and dark, or by moving them geographically to a new location.

But the argument continues. Does an organism have a built-in independent clock, like a good calendar wristwatch? Or does it have an incredible sensitivity to the subtlest rhythms of its environment?

"My own view," says Prof. Brown, "is that a biological clock is like an electric clock, which really is no clock at all, but simply an instrument which measures the 60-cycle-per-second oscillations of the power supply. The organism has no clock as such, but is responding to the natural rhythms of its environment.

"Every organism thus is literally plugged into its environment. It gets its information from the 'current' flowing into it, and times its activities accordingly.

"We have kept a rat in constant darkness in the laboratory. That rat is running three times as much when the moon is below the horizon than when it is above. When its clock says, 'Thou shalt run,' it runs, and how much it runs depends upon the phases of the moon, which it has no way of seeing."

How does the rat know the phase of the moon, or the time of day? Prof. Brown first suspected that organisms might sense a subtle change in the Earth's magnetic field. Such changes show a 24-hour rhythm. The magnetic field also varies very slightly with the phase of the moon.

To find out whether organisms have such sensitivity, he built a "snail house" with a single narrow door. When a mud snail came crawling out the door, it had the option of turning right or left. Thousands of experiments showed that mud snails had a strong tendency to turn right at certain hours of the day, left at others (and incidentally, they showed another rhythm—a monthly one, corresponding to

*(Please turn to page 228)*



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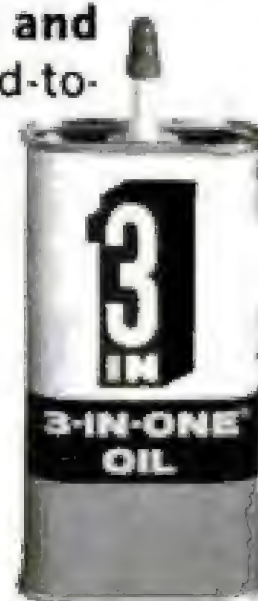


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## BUILT-IN CLOCKS

(Continued from page 226)

the phases of the moon).

Next he subjected the same snails to a very slight alteration in their natural magnetic field. He found that he could manipulate the snails' turns by such changes in the magnetic field. Obviously, mud snails have the sensitivity to detect very weak magnetic influences.

He also discovered that many organisms have a fantastic sensitivity to minute changes in the electrostatic field and to very weak background radiation, which also follow a daily cycle in the earthly environment. Others have found that living things respond to very small changes in radio frequencies.

"If you see an animal, concealed from all obvious information, telling you the phase of the moon, the time of the year, the condition of the tide, and the precise time of the day," argues Prof. Brown, "I think it's time to admit that it is getting an input from its environment."

"Even our orbiting astronauts, so far, have been subject to such input, for they were still deep inside the region of the Earth's influence. Only by sending an organism far away from our planet, for example, into a solar orbit, can we know for sure whether such subtle influences may be resetting its clocks daily."

### Test with "spudnik"

Such experiments already are in the planning stage, and some may occur this year. Prof. Brown has proposed, as our test astronaut, a solar-orbiting potato—a "spudnik."

"It's ideal for such tests," he says enthusiastically. "A spud absorbs oxygen and gives off carbon dioxide, not only in a daily rhythm, but also in a monthly rhythm. Furthermore, its respiration fluctuates with the barometric pressure, *even when it's sealed inside a constant-pressure box*. You can't tell me that a good deal of information isn't getting through to that spud."

"Now, if we fling a potato around the sun, it will be free of all possible biological timers on Earth. There won't be any 24-hour rhythms of any kind. The experiment will indicate two things: First, whether any rhythms remain at the end of, say, 90 days; and second whether a living organism is able to survive in the absence of Earthly rhythms to reset its clock."

"My own opinion is that all biological clocks must be controlled by the Earth's rhythms; if they aren't, the organisms eventually will go berserk and die."

While certain biologists discuss clocks, other scientists are trying to pin down what is *meant* in any discussion of clocks—that is, the rhythmic changes in an organism. There is strong evidence that these studies will contribute significantly to medicine. Perhaps the most exhaustive medical work has been done at the University of Minnesota under Dr. Franz Halberg.

"Every organism has an entire spectrum of rhythms," points out Dr. Halberg. "In man, the metabolism, the temperature, the secretion of hormones, the blood-cell count and scores of other body functions show rhythmic patterns. In many body functions, we find rhythmic changes with several different frequencies. The about-24-hour rhythm, called a circadian rhythm, is common to most body functions."

In the laboratory, when the eyes of some organisms have been removed, their rhythms don't match any known rhythm in the environment. Such "desynchronized" rhythms also were found in men who were isolated in a deep cave in France for periods up to four months. This evidence seems to indicate that at least some of our rhythms continue in effect, although in altered form, in the absence of any periodic input from our environment.

Dr. Halberg and Dr. Maurice Garcia-Sainz, working with a computer, have discovered that cell divisions in human cancers show abnormal rhythms, with faster rhythms predominating over a "weak" circadian rhythm. They hope that radiation treatment can eventually be timed to the highest sensitivity of the fast rhythms in a tumor on the one hand, and the lowest susceptibility of the patient's circadian system on the other.

### Noise and death

In other experiments at the University of Minnesota, mice have been exposed to high levels of sound at various times of the day, corresponding to different stages of their circadian rhythms. Most of the mice exposed to the racket during one phase of their circadian system recovered; most of those exposed to the same noise level 12 hours earlier or later underwent convulsions and died.

An obvious question occurs: Are humans more likely to die when they are exposed to potentially dangerous agents at certain times of the day, rather than others? If so, can we adjust our lives so that we are exposed to injurious situations only when we can stand them?

Certain diseases (among them, Cushing's Syndrome and filariasis) now can be



readily diagnosed through distinctive patterns of biologic rhythms. There is also evidence that emotional illnesses, such as schizophrenia and manic depression, may also be related to the speeding up or slowing down of certain internal rhythms.

Even more promising are experiments in the timing of drugs and medicines at the University of Minnesota, the Chicago Medical School and the University of Oklahoma.

"We now are asking," says Dr. Halberg, "not only what amount of a certain drug should be used, but at what time the drug should be administered in relation to the patient's circadian system, since the effect of a drug may vary drastically with the time it is administered. In fact, work with animals indicates that timing frequently can tip the scales between life or death when a heavy dose of certain drugs is used."

Dr. Allain Reinberg of Paris, France, has recently found that human beings indeed undergo hours of changing resistance to the effects of histamine and antihistamines, depending upon the stage of their circadian rhythms.

Since rhythms frequently differ from a precise 24-hour period, Dr. Halberg points out that "it is not the clock hour

that is important in administering some drugs and medicine, but the physiologic timing."

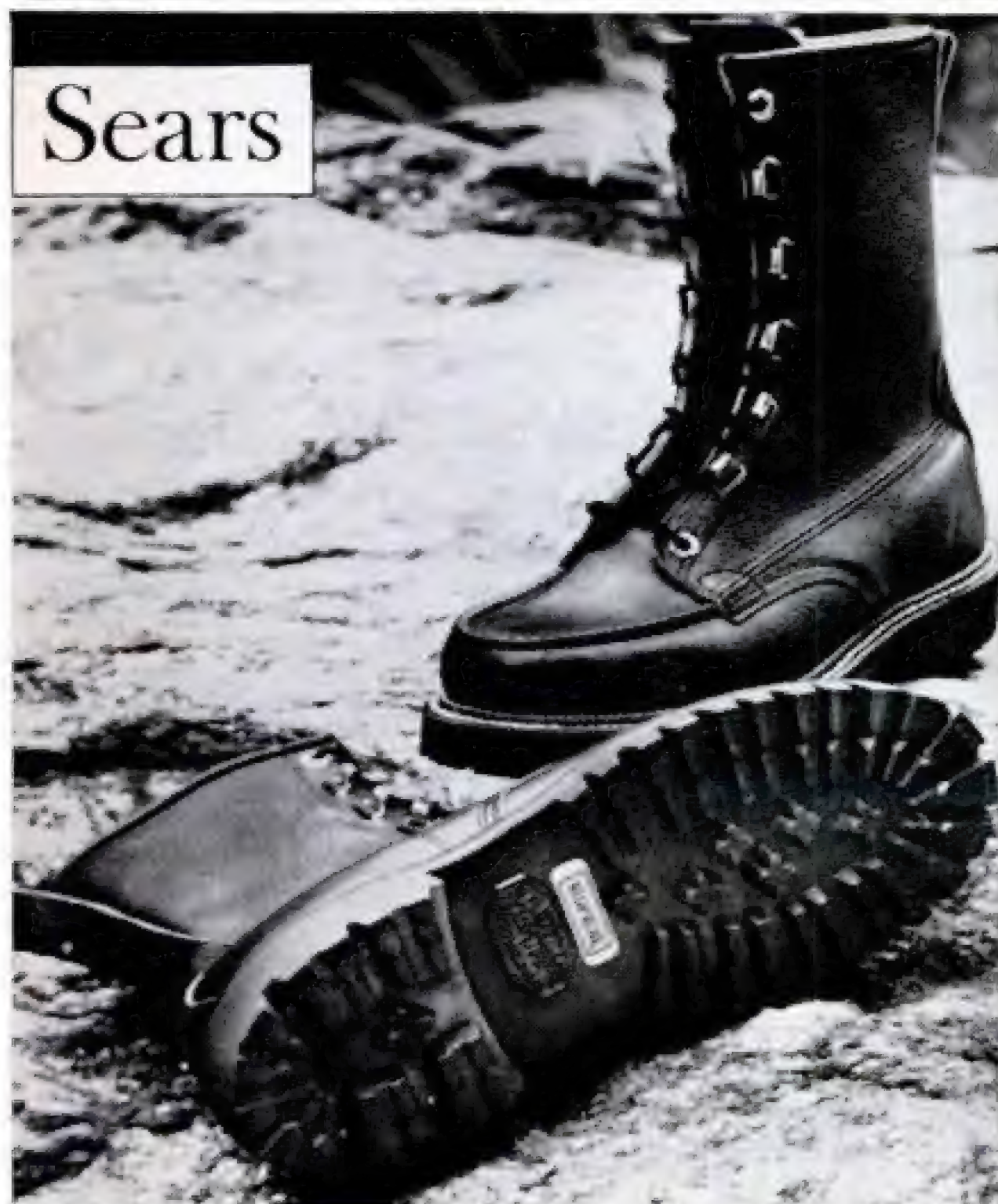
Those jetting scientists who tested their own reflexes discovered that, in the perceptive words of Shakespeare, "the time is out of joint."

Putting time back into joint may not only be one of the secrets of enduring health, but one of the biggest obstacles that man must overcome before he can reach for the stars. ★ ★ ★

## Pony is no dumb bunny

Though his brain is smaller, the pony plays no second to the elephant in ability to recognize visual cues.

After successfully testing an elephant's recognition of geometric-patterned cards, Dr. Jane C. Dixon of Western Reserve University, Cleveland, Ohio, applied the same test to a seven-year-old gelding pony. After the pony had selected one card out of 20 pairs, the cards were shuffled and the pony instructed to distinguish his original choice—at the incentive of a carrot. Result: the pony caught on to the game just as readily as the elephant—in spite of less "grey matter" to work with.



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enough to wear on the job.  
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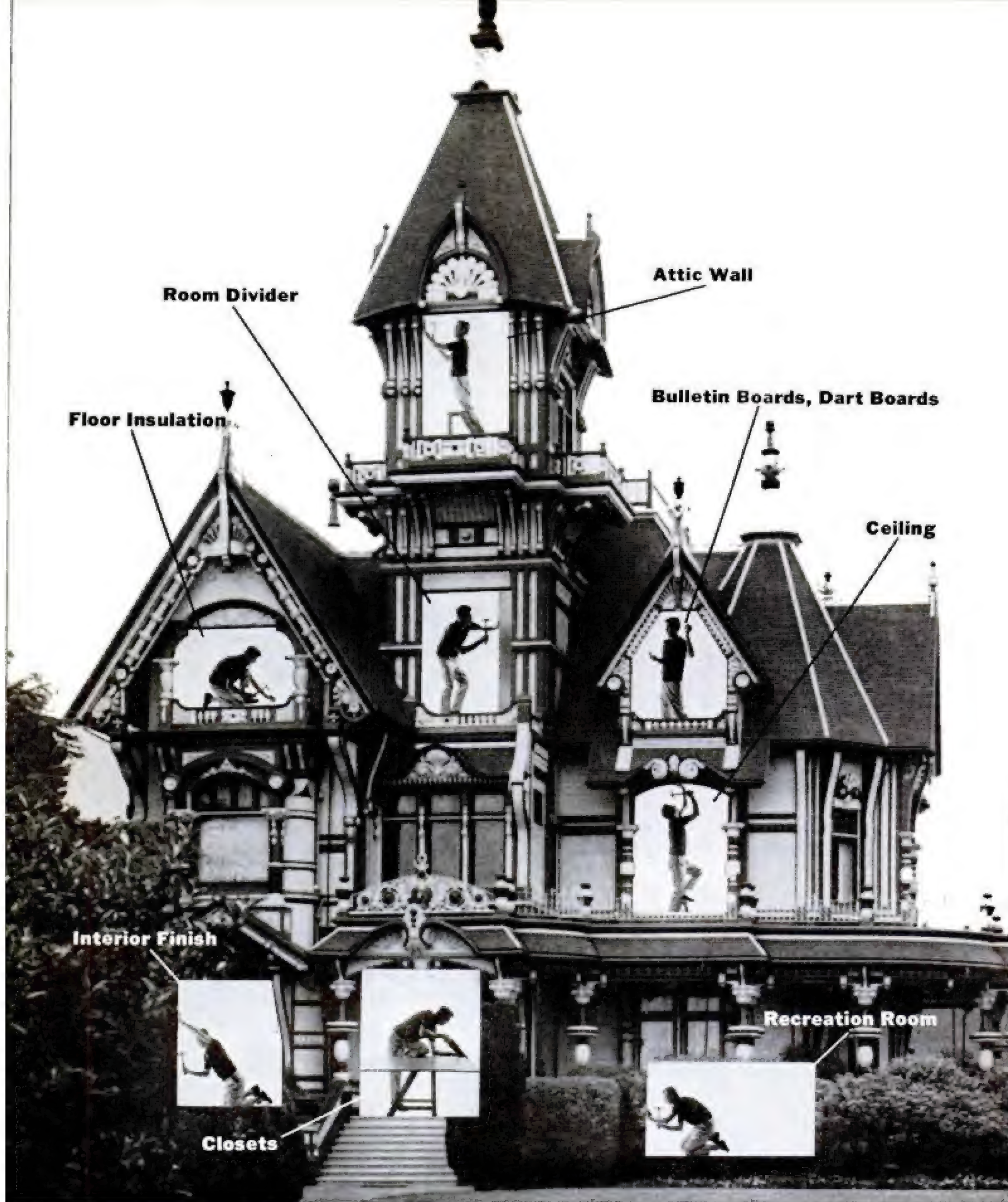
No job's too rough for these tough, easy-on-your-feet Gold Bond\* boots. They have brown oil-tanned uppers, double-deck storm welt, longitudinal arch support, plus Vibram soles of Du Pont Neoprene which adds a big bonus of wear-without-care... for Du Pont Neoprene has proved resistance to oil, chemicals, abrasion, heat and cold. Wide range of sizes. Ask for style 86106.

\*Sears Reg. T.M.



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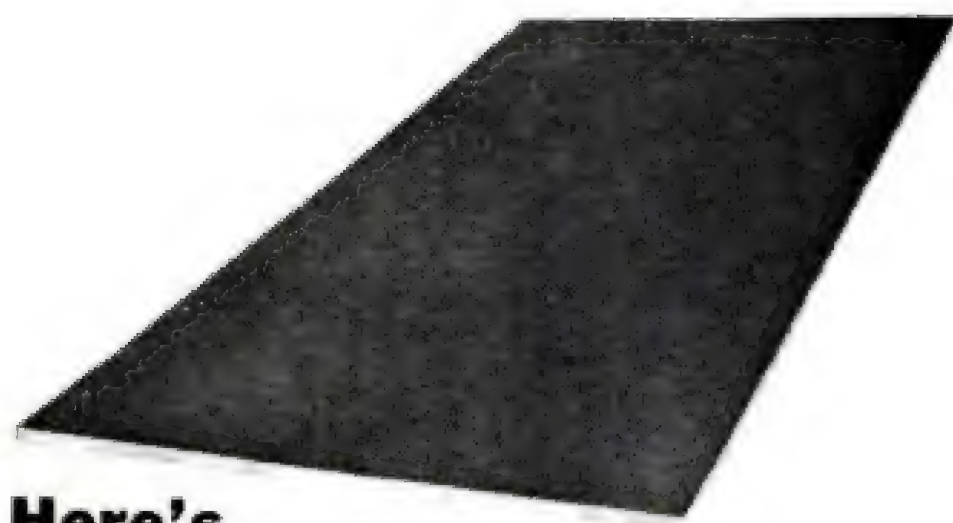
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paneling over it. TF 510 is made with white, washable polyethylene facing.

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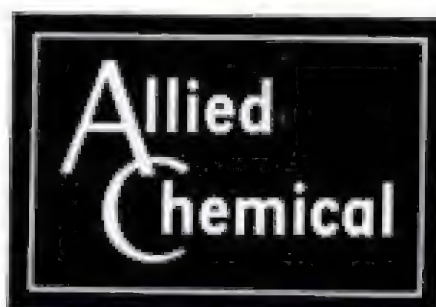
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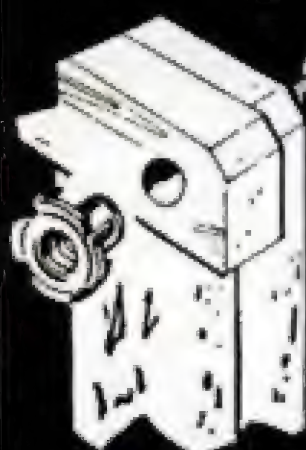
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## '67 OUTBOARDS

(Continued from page 99)

**The 1967 Chrysler Line**—27 models with the following horsepower ratings: 105, 75, 55, 45, 35, 20, 9.2, 6 and 3.5.

**JOHNSON.** Like Evinrude and Mercury, Johnson's biggest news is electronic ignition on the 100-hp model, the biggest Sea Horse of them all. Other developments include a new folding-type 3-hp fishing motor similar to that introduced by Evinrude last year and a great many under-the-shroud improvements on almost every model. Johnson will also offer an elevating transom bracket in '67.

**The 1967 Johnson Line**—various models rated as follows: 100, 80, 60, 40, 33, 20, 9½, 6, 5 and 3 hp.

**McCULLOCH.** New this year will be long-shaft models of the 4-hp and electric-start 9-hp motors. Remote control kits will also be available for the ultimate in sailboat auxiliary power. As inventory is depleted, McCulloch will discontinue the 7½-hp standard and offer only the weedless version, with or without electric starting.

**The 1967 McCulloch Line**—various models in the following sizes: 75, 45, 28, 14, 9, 7.5 and 4 hp.

**HOMELITE.** The 55-hp Homelite is still the only four-cycle outboard available in the United States today. The motor will remain basically unchanged for '67. Formerly a division of Textron, Homelite was sold this summer to Fisher-Pierce, manufacturer of those fine Boston Whalers.

**The 1967 Homelite Line**—one model rated at 55 hp.

**SEARS.** With electric-starting 7½-hp and 9-hp models, Sears will have a strong pitch for lazy fishermen. The battery recommended for use with these motors is a light (21-pound) 12-volt Allstate. Starter cables attach semipermanently to the battery and plug into a receptacle on the motor. A plastic battery box/carrying case is also available.

**The 1967 Sears Line**—various models rated as follows: 75, 45, 28, 14, 9, 7.5 and 3.5 hp.

**MONTGOMERY WARD.** Offering a full selection of motors from a 80-hp powerhouse all the way down to a little 3½-hp air-cooled fishing motor, the biggest change in the 1967 Sea King line is the addition of a new ultra-light 55-hp mid-range motor available in four models. It's a versatile engine with a high ratio of horsepower-per-pound which combines plenty of power for skiing or cruising with good operational economy.

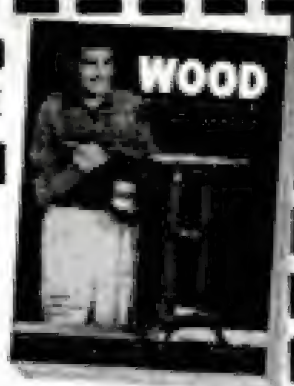
**The 1967 Montgomery Ward Line**—various models in the following sizes: 80, 55, 35, 20, 9, 6 and 3.5 hp. ★ ★ ★



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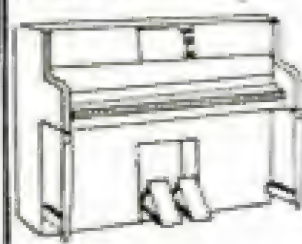
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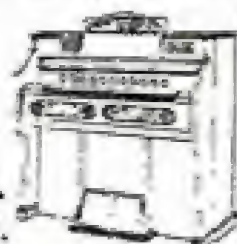
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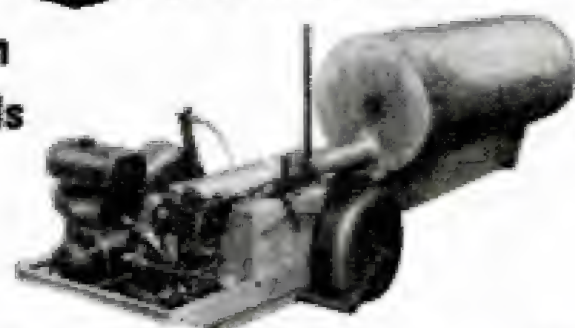
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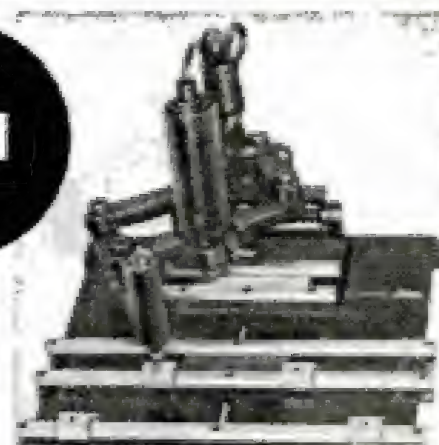


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## THE SOLID CITIZENS

*(Continued from page 117)*

below his "set" speed, a twist of the "re-sume" sleeve—also on the lever—will bring the car back up to speed, and all without touching the accelerator. This sort of amiable gadgetry is typical of all Ford Motor Co. products and undoubtedly helps sell cars. And it's fun (and at times a convenience) to operate. Ford line's engine range is carried over from last year.

**MERCURY:** New this year are a top-of-the-line Marquis and a Brougham series, the former a fancy, vinyl-topped, two-door hardtop, the latter a four-door sedan and hardtop. The Monterey two-door and four-door "Breezeway" sedans have been dropped and the Park Lane "Breezeway" four-door has been replaced by a conventional sedan. All Mercurys in this category have been shortened two inches overall. In the Park Lane, Brougham and Marquis series, a four-speed manual transmission with floor-mounted shift is optional at no extra cost (a three-speed automatic is standard). Here, too, the engine line-up is carried over from last year.

**OLDSMOBILE:** You can tell there's a star in this troupe—the Toronado. The entire line of 1967 "88s" reflect the Durante-ish profile of last year's big newsmaker. All have been shortened five inches in back, lengthened five inches in front. Olds has also been busy switching names: the new Delmont replaces the Dynamic, the Jetstar has been dropped, the Starfire has been dropped, and there's a new Delta Custom, a cut above the Delta 88. New and optional throughout the line is a climate control carburetor air inlet system that Olds claims provides "summertime temperatures for air entering the carburetor under all weather conditions." The device—a means of ducting warm air from behind the exhaust manifold to the carburetor—is also said to eliminate icing. All Olds cars have—happily—a look about them that suggests everybody in the company is not *completely* subservient to the principles of cost accounting. It's an impressive, good-looking line.

**PONTIAC:** Overall length of Pontiac offerings in this category has been upped an inch all down the line. New is a Grand Prix convertible, available as such for the first time. Also on the Grand Prix this year is a distinctive styling touch—the parking lights are set behind three narrow slots in the fender extension above the outer ends of the grille. Engine dis-

placement has been upped on Pontiac's standard V8s—389 to 400 and 421 to 428 cu. in., respectively. The attention-getter this year will probably be the recessed windshield wipers, available on all models in this category. The design adds considerably to a cleaner, longer looking hood. Overall, there are the usual minor exterior and interior styling ploys and a brassily proclaimed "safety package" similar to those being offered by other manufacturers.

**PLYMOUTH:** There are 59 models in the overall Plymouth line, 25 of which are variations on the Fury theme and fall into the standard family-size category. This means a potential buyer has to figure his way through the morass of intraline distinctions, some of them infinitesimal. As with all Chrysler Corp. cars for '67, Plymouth's styling boasts are loud but elusive; the cars aren't nearly as changed as the manufacturer keeps saying they are. True, some skin metal has been bent a little differently and some "distinctive" touches have been added here and there. The line, however, remains what it always has been—solid and sensible. Standard on all four-door hardtops, the Sport Fury "Fast Top," and the VIP two-door hardtop is a new "flow-through" ventilation system, said to be capable of changing the air four times each minute at 60 mph with all windows closed and all ventilators open. The engine line-up totals five—the 225 cu. in. being the standard Six, the revised 318 cu. in. the standard V8.—Bill Kilpatrick

### Powder puffs for GIs

Powder puffs may soon be in every soldier's battle kit. Scientists have found the puffs ideal for mopping up dangerous chemicals which might attack unprotected skin areas in the event that chemical warfare is ever resorted to by a future enemy.

Along the same lines, the Army has come to the aid of squeamish soldiers who can't stand sticking with a needle, even if it's to protect themselves from nerve gas. All soldiers today carry atropine syrettes in their gas mask carriers as an antidote for nerve gas. But the Army has found many reluctant to administer the needle. So medics have come up with automatic injectors whose needles can't be seen until after a soldier has received the injection.

The injector has a blunt end which a soldier presses firmly against his thigh. A spring-loaded device injects both needle and fluid so quickly, even through clothing, that the man couldn't prevent getting the shot if he tried.



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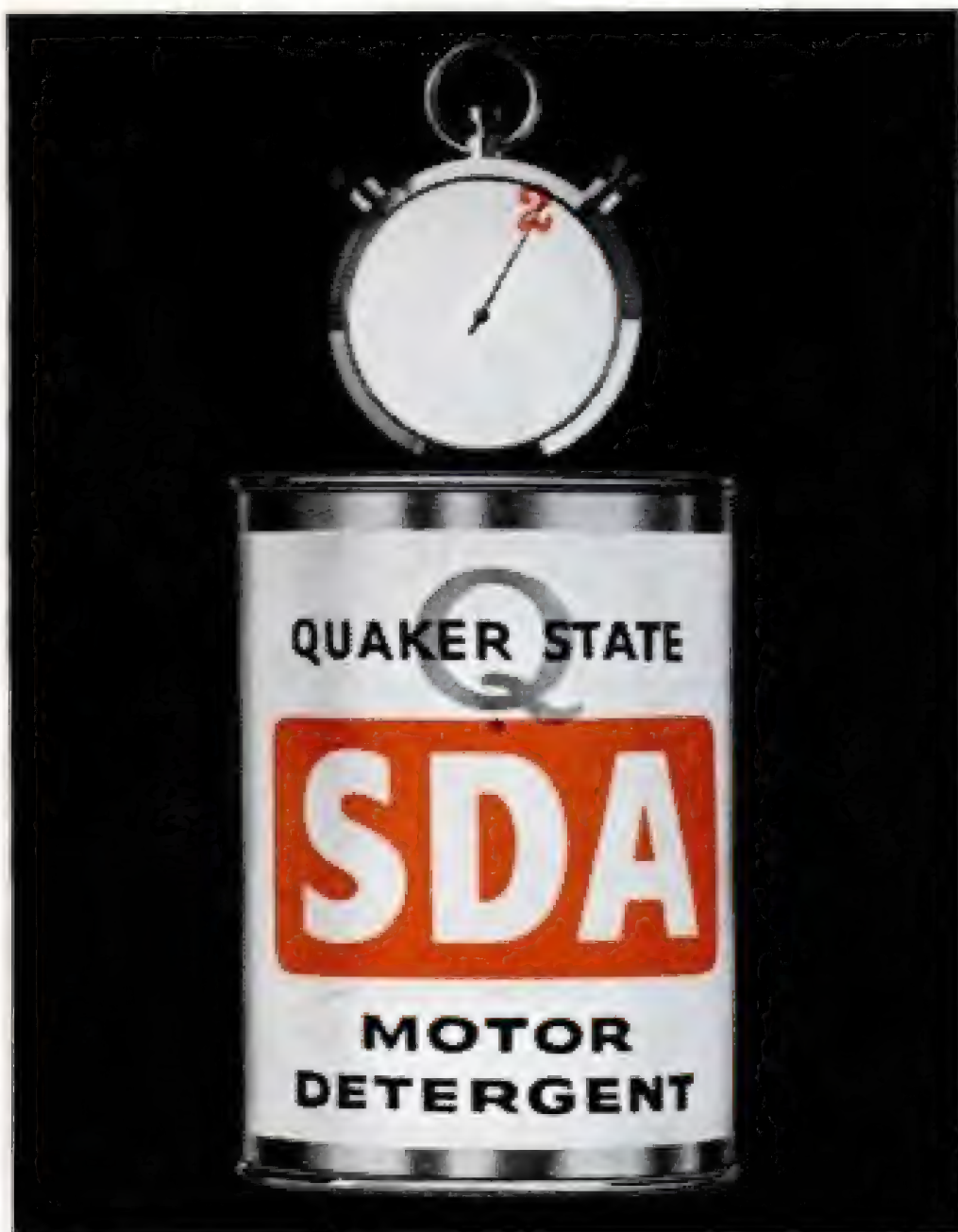
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## THE REALLY NEW ONES

*(Continued from page 109)*

shifting in the first place—to slow down. Shift levers are either floor or console-mounted.

Powered by the optional 390-cu.-in., 4-bbl. V8 (there's no Six), the Cougar is a lively performer, particularly with the ever-present "handling package." And this despite the car lugging around over 120 pounds of sound-deadening material. Front disc brakes are optional.

Overall, you'll like this one, too. It's go-go without pandering.—*Bill Kilpatrick*

## COMPACTS: THE HOT ONES

*(Continued from page 109)*

delight in the small touches, "technical advancements" and options as you scrutinize the car in the showroom. You'll come across an all-glass "folding" rear window in the convertible, easier window operation, foot-operated windshield washers, and other new-for-'67 surprises in addition to the across-the-board safety features.

Aside from front and rear track being up to 58 inches and new front suspension and steering linkage, the big addition this year is the GT engine. It's a 390 cubic incher with 4-bbl. carburetion putting out 320 hp. A three-speed manual transmission is standard, but four-speed and Ford's Cruise-O-Matic are available. Optional rear-axle ratios can be had with all, but only if you take the optional limited-slip differential that goes along with it.

**ROGUE:** There's hardly a little old lady's car left on the road. I suppose the bottom of the Rambler American line—with its 128-hp engine—might do, but the top of the line with its masculine "Rogue" nameplate and 225-hp V8 never would.

The 290-cu.-in. "Typhoon" engine is available in both 2- and 4-bbl. versions at 200 and 225 hp, respectively, measured at 4600 and 4700 rpm. Corresponding compression ratios are 9:1 and 10:1.

For controlling a lot of engine and a little car, American Motors offers what has become a ubiquitous industry option—the "handling package." The "V8 handling package" for the American series consists of heavy-duty springs and shock absorbers and 5½-in.-wide wheel rims. And it's a package well worth packing, making a world of difference in overall general handling.

If you passed up the Rogue last year because it wasn't available with a flip-top, this year you won't have to. It's out in hardtop and convertible.—*Bill Hartford*



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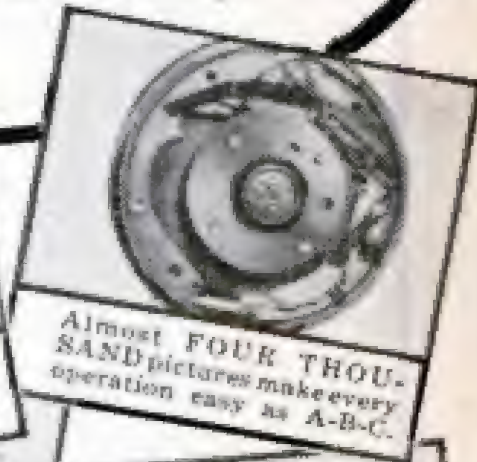
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Continental	Ford Bronco	Mustang



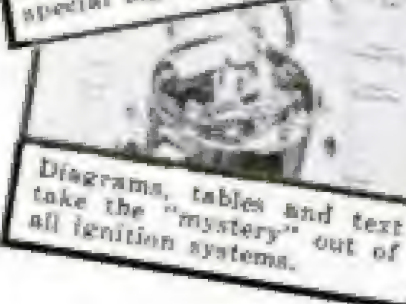
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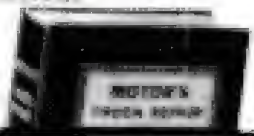
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# CAULKING

(Continued from page 174)

solvent or by contact with air.

Some sealants are designed to remain permanently tacky. PR-615 and nonskinning butyl rubber, for example, are sealants that permit unsealing and resealing without fuss. A hatch cover on a boat can be sealed watertight with PR-615, yet if it must be removed, the sealant will part without tearing. To reseal, simply press the cover back into place again. The only problem is to keep from touching the sealant while the joint is apart. PR-615 sealant will stick tenaciously to almost anything, particularly fingers.

**TIPS ON CAULKING.** Regardless of which kind of sealant you select, it will probably fail if the surface isn't clean and dry. Most sealant failures result from poor surface preparation—hurrying through the job and hoping that somehow the stickiness of the sealant will compensate for poorly prepared surfaces. Except for jobs involving sealants that cure by absorbing moisture, make sure the surfaces are *dry* and *clean*. And remember that any sealant will fail if the surface is *wet*—even those that absorb moisture.

Soapy or oily films are the commonest causes of poor adhesion. Don't, for example, clean glass with a detergent prior to caulking. The detergent will leave a thin, invisible film that acts as a release agent. One of the best ways to clean glass is to scrub with a slurry of fine pumice and water. Allow a thin film of the pumice to dry on the glass, then wipe off with a clean cloth just before squeezing in the sealant. Or wipe the glass with a cloth dampened with the same solvent used to clean up the sealant you plan to use and, before the solvent evaporates, wipe with a clean white cloth.

Another trick is to use a 50-50 mixture of xylol and acetone as a final solvent cleaner before sealing. The xylol removes any oil film and the acetone dries the surface chemically.

Certain materials are likely to have a film on the surface that prevents long-term adhesion by a sealant. Quarry tile, for example, may have a thin coating of paraffin on the surface which is difficult to remove chemically. Try sanding with a coarse abrasive before caulking. Bricks may have been treated with a silicone-base water repellent which also acts as a release agent to prevent adhesion.

Concrete and stone sometimes have either a thin surface of lime or a loose, partially delaminated surface that prevents a watertight seal. One sealing contractor clears away any loose surface or lime by sanding the edges with a very

coarse disc sander and following with a vinegar or weak muriatic etch. The sanding-etching procedure is particularly necessary when sealing underwater joints, as in a swimming pool.

Metal should be thoroughly cleaned with a wire brush or by sandblasting. A rotary wire brush chucked in an electric drill will usually do a good job of removing loose rust and dirt.

When using any sealant, be sure to follow the manufacturer's directions to the letter. If a primer is called for on specific surfaces, don't try to get along without it. Manufacturers do all they can to eliminate the need for a primer, so if they call for one you can be assured that it's necessary. Some materials can be used when temperatures are below freezing, others require temperatures near 70° F. Here again, follow directions.

Because of the wealth of material it contains, the chart spreads over several pages which must be clipped from the magazine and pasted side-by-side on a large sheet of cardboard, for permanent reference. All major categories of sealants are covered in the three main panels on pages 172, 173 and 175. To complete the chart, however, with full coverage of miscellaneous materials, you must clip page 241 into three more panels and mount these side-by-side along the bottom of the others.

Many of the specialty materials mentioned in the chart are not generally available at hardware or paint stores. If you have difficulty locating a source for one of these, either look in the classified pages of your telephone book, or write directly to the manufacturer at the address below. (The numbers in the chart's Manufacturer column are keyed to this list.) ★ ★ ★

## List of Manufacturers

1. General Electric Co., Silicone Products Dept., Watford, N.Y. 12188
2. Dow-Corning Corp., Midland, Mich. 46641
3. Sonneborn Building Products, Inc., Sub. of De Soto Chemical Coatings, Inc., 1700 S. Mt. Prospect Road, Des Plaines, Ill.
4. Pittsburgh Plate Glass Co., Adhesive Products Div., 225 Belleville Ave., Bloomfield, N.J. 07003
5. DAP, Inc., P.O. Box 999, Dayton, Ohio
6. Pecora, Inc., 300-400 W. Sedgley Ave., Philadelphia, Pa. 19140
7. The Gibson-Homans Co., 2366 Woodhill Road, Cleveland, Ohio 44106
8. Three M Co., Adhesives, Coatings and Sealers Div., 2501 Hudson Road, St. Paul, Minn. 55119
9. West Chester Chemical Co., P.O. Box 39, West Chester, Pa.
10. Gates Engineering Co., P.O. Box 1711, Wilmington, Dela.
11. Tufcrete Co. Inc., 502 East Locust St., Des Moines 9, Iowa
12. The Cambridge Tile Mfg. Co., Cam Products Div., P.O. Box 15071, Cincinnati 15, Ohio
13. The Borden Chemical Co., Mystik Tape Div., 1700 Winnetka Ave., Northfield, Ill.
14. Products Research Co., 2919 Empire Ave., Burbank, Calif.
15. Miracle Adhesives Corp., 250 Pettit Ave., Bellmore, L.I., N.Y.
16. The Goodyear Tire & Rubber Co., Chemical Div., 1144 E. Market St., Akron, Ohio 44316



# SEALANT CHART (Continued from pages 172-175)

Multipurpose adhesive and caulk for boat and home use. Fills areas like a wood putty; can be sanded smooth. Fills holes for seating expansion bolts, prevents nuts from loosening; patches canvas, leaks in metal containers and seals joints in buildings and boats	MISCELLANEOUS Reclaim Rubber & Caulk	Miracle Adhesives Corp. (15)	Miracle Black Magic	Black	Mineral spirits Toluol
Replaces filled linseed oil for general around-the-house caulking jobs	Unknown Material	Sears, Roebuck & Co., Stores & Catalog	5-Year Guar- antee Sealer- Caulk	White	Mineral spirits
Thin seam sealing in metal joints, but also adaptable for porous and non-porous construction materials, including glass. Can be applied at low temperatures. Useful in sealing metal buildings, downspouts and gutters	Nitrile Rubber	The Goodyear Tire & Rubber Co. (16)	Pliogrip Seam Sealer Self-Leveling Sealant Sealing Com- pound	Aluminum	Methyl ethyl ketone
Roof repairs, coarse caulking at any interface with tar or asphalt material, such as blacktop driveway or roofing	Chemically Processed Asphalt Base	DAP, Inc. (5)	DAP Black-Tite	Black	Mineral spirits Naphtha
Caulking inside and outside, particularly with latex (water-thinned) paints. Also, a useful caulk with alkyd or oil-based paints	Acrylic Latex Emulsion	DAP, Inc. (5)	DAP Latex Caulk	Bright white	Water

None	Solvent release		10-20%	Excellent	Tube @ 59¢
None					Std. cartridges @ \$2.79 by mail from catalog plus delivery charges
None	Solvent release	74-80	10-30%	Good	Seam Sealer—5-oz. tubes, 5-gal. pails Self-leveling Sealant—1/10-gal. cartridges, 5-gal. pails Sealing Compound—1/10-gal. cartridges, 5-gal. pails
None	Solvent release	50-60	5-10%	Fair	Std. cartridges @ 66¢
None	Air-dry and self coalescence	50-60	10-15%	Excellent	Std. cartridges @ \$1.87

\*Rubber hardness on Shore Durometer A Scale Reading of 20 is about equal to hardness of rubber in a baby bottle nipple.

Versatile combination caulking compound and adhesive. Adapted for adhering flashing or other material to damp surfaces. Use only where black color is not objectionable or is to be painted over. Cured Black Magic can be sanded to a feather edge and painted

Five-year guarantee indicates obvious improvement over oil-base caulk. Exact material base not known

All 3 products by Goodyear carry the Pliogrip trademark.

Seam Sealer is a free-flowing paste for sealing seams on aluminum gutters, downspouts, storm doors and other metal joints. Use on seams no wider than 1/8 in.

Self-leveling Sealant flows readily and should be used only on horizontal joints in wood, metal and masonry

Sealing Compound is a nonsag caulk for vertical or horizontal joints in windows and flashing

Allow at least 30 days before painting

Asphalt sealant is not a conventional caulking material. It can be painted over by using 2 coats of oil-base paint. Asphalt-base tube caulking useful mainly for plugging roof leaks and for caulking edges of roofing, bedding flashing or filling cracks around drains

DAP Latex Caulk developed specifically for use under or over latex paints. It will not bleed, blush or stain. When painted with latex paint, DAP Latex Caulk actually merges with paint film to help prevent peeling



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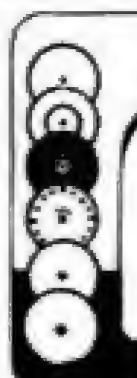
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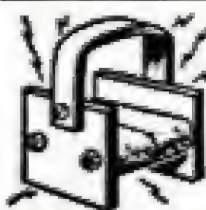
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## WORLD'S DIRTIEST DRAG RACE

(Continued from page 131)

cylinder buggies in use in the 'Glades are \$3000 to \$5000 investments. Beasley says he has under \$2000 in Half-Fast II, but he did all the work himself. Of the total, he has \$500 in the engine alone.

Chains are nearly universal on swamp buggy wheels. Contest rules limit them to seven-inch links of half-inch stock, which is plenty of leeway. Many sets are welded up a link at a time from reinforcing rod. Using what's handy, buggy builders learn to adapt mismatched transmissions and drive trains with home-built plates and joints. Often a good man with a welder will build his own frame. All linkages are usually reworked—gear-shifts, throttles, steering gear—because of the high seating and change of driver position. Using two transmissions for lower gearing is common; some buggies put three gearboxes in a row.

For competition or for hunting, waterproofing is essential. Some favor baffles; some isolate their engines; some put their faith in one or another kind of applied compound. Beasley uses 12 spray-can coats of goo on the ignition system once it is set. With air intakes high in the air,

carburetion takes some jiggering.

Every such modification requires testing and hard use to prove it. Thus, a buggy builder has a time-consuming hobby. Since the only way to learn to drive a buggy is to get in it and go, buggy builders are usually hunters, too.

A first-time ride in a good buggy well-driven through the Big Cypress Swamp is an eye-opener. The only objects a buggy goes around are big trees and thick woody brush clumps. Where there is no need for speed, the only unusual feeling is a camel-like pitch and sway and a certain amount of eye-popping as the driver casually boots his machine through places anyone else would have to walk or swim.

A race is something else again. When a racing driver showers down on a couple hundred horses and belts into a pothole, throwing mud and water 40 feet in all directions, that high-up perch becomes a wild-and-woolly saddle on a rodeo animal, perhaps a high-speed bucking giraffe. It takes seat belts, two hands and two tightly-braced legs just to stay aboard. With other buggies throwing water from alongside, a yelling crowd on the sidelines, and the sounds of good machinery working hard, a ride on a racing mud monster is a guaranteed thrill. ★★★

# How to choose a MOTORCYCLE!

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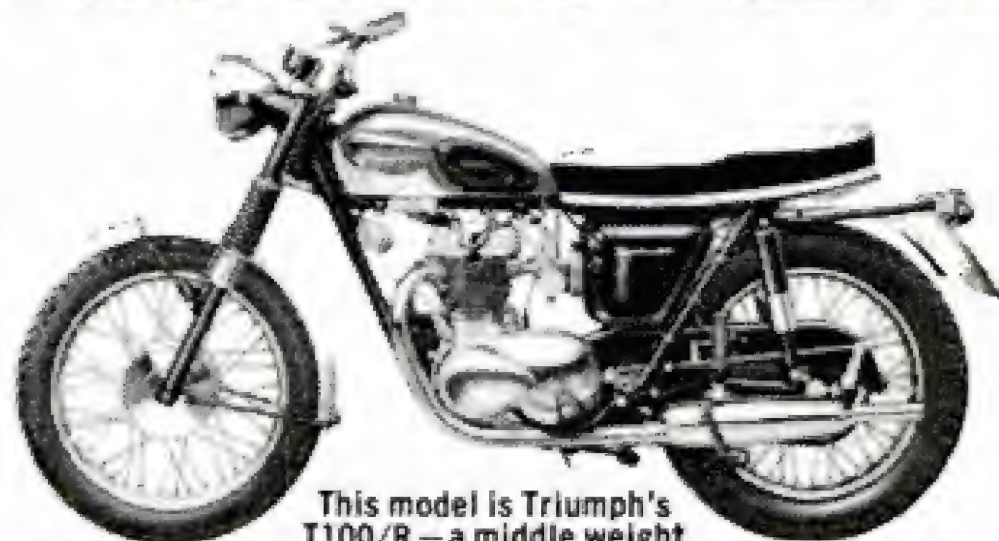
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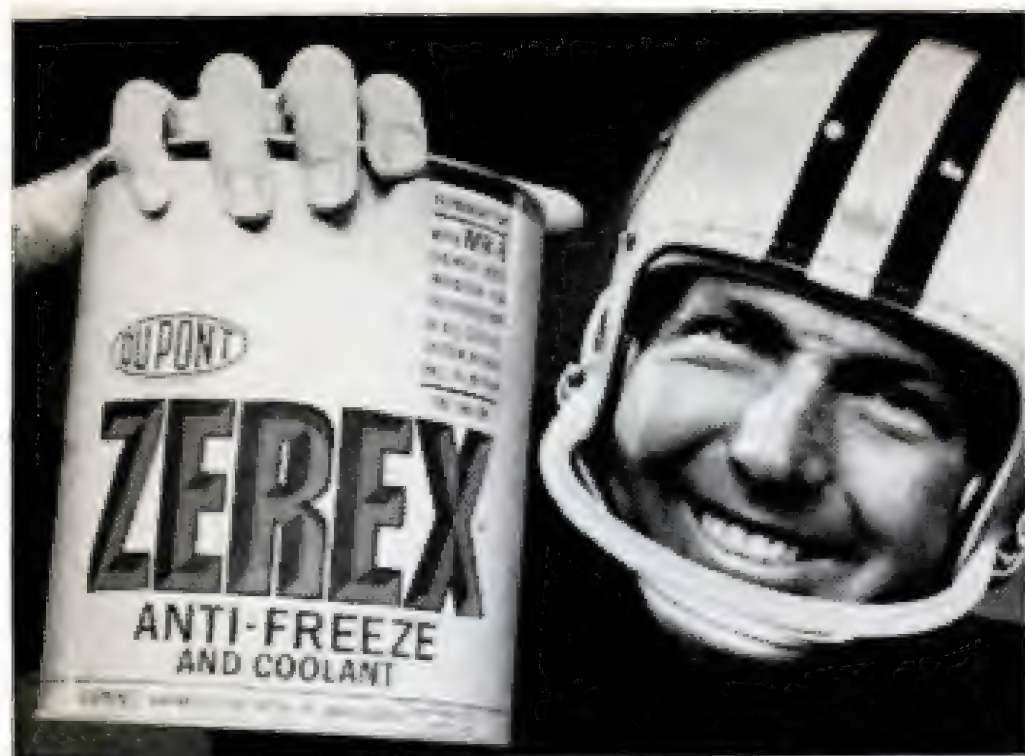
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## 1967: THE SHOWDOWN YEAR

*(Continued from page 104)*

lined above 70 mph to "point up the dangers of high-speed driving."

Still another example of Detroit's ambivalence vis-a-vis performance and safety might be gleaned from Chrysler Corp.'s mid-July decision to get out of stock-car racing, a sport it dominated this past year. Ford Div. had backed out earlier, now apparently plans to go back in. Chevy has been officially away from the tracks for some time. Yet a series of stock-car wins proves a manufacturer knows his performance onions.

So regardless of whether or not they are officially in racing, and regardless of how thick the safety flak gets, auto makers know where the money is—particularly "new, young" money—and it's in performance.

### Showdown on safety

Critics who claim auto makers are dragging their feet on safety are pouring out of the woodwork, particularly in government, an area where they can ruffle the most manufacturer feathers. The seeming conflict between performance and safety, for example, could well be settled in Congress, a thought Detroit doesn't like one bit. Safety is tied in with sales, too; buyers know government requirements are going to be more stringent next year and may bypass the '67s to wait for what they think will be "safer" cars. This thought has Detroit vibrating.

To counteract these and other "negative" aspects of the safety controversy, Detroit this year will loudly promote what throughout the industry amounts to a pretty much universal safety "package" of both standard equipment and optional items. Despite a wrinkle there, a touch here—often inspired by styling and cost accounting as much as anything else—the typical safety "package" includes a dual-brake system, an energy-absorbing steering arrangement, optional shoulder harness, recessed dash knobs and instrumentation, padded and break-away rear view mirror, four-way hazard flasher, two-speed windshield wipers, front and rear seatbelts, extra dash and seat padding, a lane-change signal flasher and so on—most items being standard equipment.

Heart of the dual-brake system is a dual master cylinder, one half of which serves the front wheels, the other half the rear wheels. The theory is that even a rare break in a fluid line—with subsequent loss of pressure—will not render a

car brakeless; failure of either half of the system will not affect the other. Should either half fail, a warning light—usually on the dash—will flash accordingly.

Energy-absorbing steering arrangements include a combination of center-recessed wheel and collapsible column, or—in Ford products—simply a deep-dish, break-away steering wheel.

The collapsible device, made by GM's Saginaw Steering Gear Div. and used throughout the industry except by Ford, features two basic elements—snap joints holding both solid and tubular shafts of the steering column together, and an outside shaft jacket, the ten-inch-long mid-section of which is fashioned of malleable steel mesh. Also, the device is mounted to the instrument panel by special break-away bracket capsules. Upon impact pressure (variously quoted as being between 800 and 1200 pounds) the entire device telescopes and collapses like an accordion, thereby minimizing (or at least reducing) possible driver chest injury. In the event of an impact whereby the column is even slightly collapsed, it cannot be repaired, must be replaced.

Ford's deep-dish steering wheel, on the other hand, simply gives away upon sufficient impact.

Government General Services Administration (GSA) requirements specify that regardless of from which end (or both) of the steering column impact energy is absorbed, the column itself must not—upon receiving a certain minimum force—be driven more than five inches back toward the driver. All such arrangements offered as standard equipment this year are said to meet GSA requirements.

Other devices in the typical safety "package"—outside rear-view mirrors, antiglare brightwork, break-away arm rests, single all-door locks, padded sunvisors, back-up lights, plastic window crank knobs and so on, plus dual-brake systems and energy-absorbing steering devices—will be highlighted to prove Detroit wants both its customers and critics to know it places safety on a par with divinity and motherhood.

In fact, so sensitive are manufacturers to criticism and the niceties of hair-splitting semantics they now term as "energy-absorbing" the steering column that only a year ago was called throughout the industry merely "collapsible." Auto makers fear buyers might think of a "collapsible" column as being flimsy and unsafe. Also, many heretofore plain old styling ploys are now billed as being "safety-oriented" and "safety-styled."

Actually, the new cars are "safer" than

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## 1967: THE SHOWDOWN YEAR

(Continued from page 236)

in any previous year. Attention has been and is being paid to such considerations as absorbing impact energy via the body and frame and providing for the "second collision" consequences involving driver and passengers. There is a hope (fervent in this corner) that marshmallow suspension concepts may be dying an overdue death. In any event, the safety principle has been thoroughly established and from here on, within economic limits, will be refined and improved upon. But realize that even standard equipment safety provisions will boost the price of your new car, now and in the future. Safety or no, the name of the game is profit and loss.

### Showdown on quality control

Here the romance between Detroit and its customers is *really* coming apart at the seams. Regular readers of *PM Owners Reports* know poor workmanship shows up time and again on lists of owner gripes about their new cars. Detroit knows it, too; production line and inspection goofs are driving manufacturers (and dealers!) batty. Auto makers claim they are pressing hard on quality control.

"Regarding quality control, we have here at Ford—if I may borrow from Lloyd Douglas—a 'magnificent obsession,'" Don Frey said recently.

He wasn't kidding. All manufacturers are doing their level best to de-bug production lines and procedures. Still, largely because cars are put together by human beings, mistakes do occur—cars roll off the line minus a vital bolt or two, or with things loose that should have been tacked down. This sort of thing is a minor annoyance and easily correctable. What sets owners' teeth on edge and often baffles manufacturers are cars that roll off with heaters installed backwards, or with body panels that somehow don't fit properly. Correcting this sort of nonsense takes time and money. But too often it's the owner's money that must be spent—at times futilely—to correct what boils down to a manufacturer's or dealer's boo-boo. Just the red tape, lost time and aggravation involved in correcting a production line slip-up are enough to make victimized owners speechless with rage. Detroit realizes this and is sincerely trying to do something about it. Witness the recent spate of cars recalled to correct defects, an unprecedented phenomenon in U.S. automotive history.

Granted, altruism had little to do with

these cars being recalled. Had the safety business not come up there's a good chance Detroit would have kept its mouth shut, its fingers crossed, and quietly tried to correct things outside the harsh light of public concern. But the fact auto makers did 'fess up and in effect admit openly they were somewhat less than perfect is a profound expression of their concern over quality.

### Showdown on "talk"

What is happening between Detroit and its market is that the latter is becoming more discerning regarding the former. People in general know more about cars—not mechanically, but regarding the part cars play in their lives. The worm, in other words, is turning, demanding more of what it wants from Detroit and less of what Detroit chooses to offer.

An example of the sort of thing buyers are rebelling against happened during Ford's preview of its new cars for magazine writers. I was driving a new four-door T-Bird when I noticed two small rubber "dorsal fins" protruding from the front fenders.

"Do those things have any purpose?" I asked the engineer sitting beside me.

"Only as reference points," he said. "With the hood shaped the way it is, certain drivers can't see the right front fender."

"They standard on all T-Birds?"

"No," he replied, "an option."

Since *when* is being able to see an option? This, I believe, is the sort of hanky-panky the auto industry is going to have to knock off. Buyers are gagging on it.

Above all—particularly in this showdown year that could see the industry under heavy fire on a number of fronts—Detroit is going to have to revise its dialogue, if only to keep itself in focus. Auto men are going to have to stop telling themselves (and their customers) that a minor variation on a fairly common piece of hardware is a "revolutionary idea," or that a tenth-of-an-inch longer whatever is a "brand-new concept." Also, they're going to have to explain just what they mean by such words as "improved," "modified," "quieter," "smoother." Otherwise, they might just as well claim cars are *milder*.

It's easy to throw stones at Detroit. It is, after all, one of the world's biggest targets. Still, after looking over all the new-car advertising and reading the promotional literature—and then viewing Detroit's products—it's a strong temptation to suggest that the Emperor has no clothes. ★★★



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## CHANGING FOOTBALL

(Continued from page 92)

offensive combinations and as many defensive combinations. On any one play, therefore, there are at least a million possible combinations of player-position and player movement. No human could possibly record them as accurately and faithfully as a camera. Nowadays, a college football team may use five cameras simultaneously—one with a wide-angle lens to pick up total-field play, another focused solely on the quarterback and the ball-carrier, a third focused on line play, and still two others stationed at each end of the stadium to pick up how far the offensive and defensive linemen and linebackers split away from each other, and from what angle they start their drives.

In pro football, the Chicago Bears are usually credited with introducing movie cameras—and of making the most of them. Not only do the Bears study game films during the season but they study the same films every day during the off-season, charting the position and movement of every man on the field—friendly and otherwise—for every play during the past season. Then they file the results on punch cards and, by using IBM machines, nail down the pattern of play used by a particular team or player.

"I never realized how thorough they were," says Edgar "Doc" Greene of the *Detroit News*—who once enjoyed the privilege of the Bears' inner sanctum—"until I saw them screening a film. They ran the same play over 30 or 40 times without saying a word. Finally, an assistant coach stood up and said, 'It's the goddam guard.' The meeting was over."

### Monday morning at the movies

All of this pays off. Back in 1959, the Bears were trying to figure out a way to beat the then champion Baltimore Colts (who'd whipped the Bears in five out of their previous six games) and to stop quarterback Johnny Unitas, who'd thrown touchdown passes in 26 consecutive games. Day after day, the Bear coaching staff studied movies of the Colts and Unitas until their eyeballs ached. Then, at 2:00 a.m. one day, Walter Halas, brother of Bears' coach George Halas and the team's chief scout, found the answer. "Hey, look at this," he said. "In certain situations, Unitas always sends four pass receivers downfield." The rest of the coaching staff snapped awake. With four pass receivers downfield, Unitas was protected by only one blocker.

That Sunday, the Bears concentrated on forcing the Colts into situations where

Unitas would send four receivers downfield. Then they assigned two defense men—both weighing 265 pounds, one standing 6-3 and the other a monumental 6-8—to crash in on Unitas at every opportunity. The poor little halfback blocking for Unitas couldn't handle one such behemoth, much less two. The result was that Unitas found himself fleeing for his life. In the first three quarters of the game Unitas completed only three passes. The Bears intercepted three, turning two into scores.

Actually, the Bears have been innovating pro football for as long as "Papa" Halas has been exercising his cerebrum in their behalf, and that goes back a long time. Just to give you a sample—on December 9, 1934, the temperature was 10° above zero and the gridiron was hard and slick. The Chicago Bears were skidding into the old Polo Grounds in New York City to do battle with the New York Giants for the National Football League championship. The Bears were at the crest of a 33-game unbeaten streak and, undismayed by the frigid temperatures, they bolted to a 10-3 lead.

### Sneaky Petes

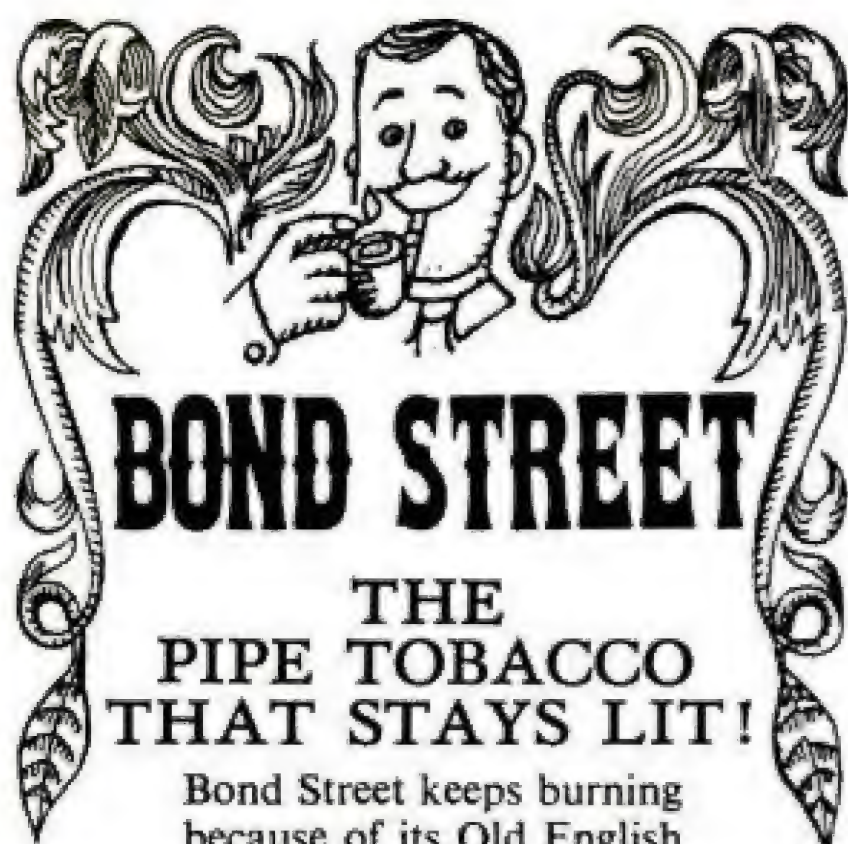
In the clubhouse at halftime, the Giants did a sneaky thing. They took off their cleated football shoes and changed to sneakers. When Halas learned of the move, he set up a counter-strategy: "Men," he announced to the team, "we've got to go out there and step on their toes!" The Bears proved to be incompetent corn-crunchers. They got a field goal in the third quarter and that was all, while the Giants flitted up and down the field to score 27 points in the fourth quarter and take the championship, 30-13.

The use of telephones in the press box is regarded as a Bear innovation, and it goes back to the early 1940s when they were exploiting the man-in-motion T-formation—i.e., sending a halfback far out to the right or left as a potential pass receiver in order to spread the defense.

To exploit this formation, the Bears put assistant coach Luke Johnsos in the press box in order to study the opponent's defense during the game. When Johnsos saw a weakness in the defense, he'd choose an appropriate play and send it via messenger to the Bear bench, which would then relay it to Sid Luckman, the great Bear quarterback. The delay was in getting the messenger from the press box to the bench through crowds. So the Bears stationed him on a ramp below the press box. Johnsos would write out his message, wrap it around the cleat from a

(Please turn to page 250)





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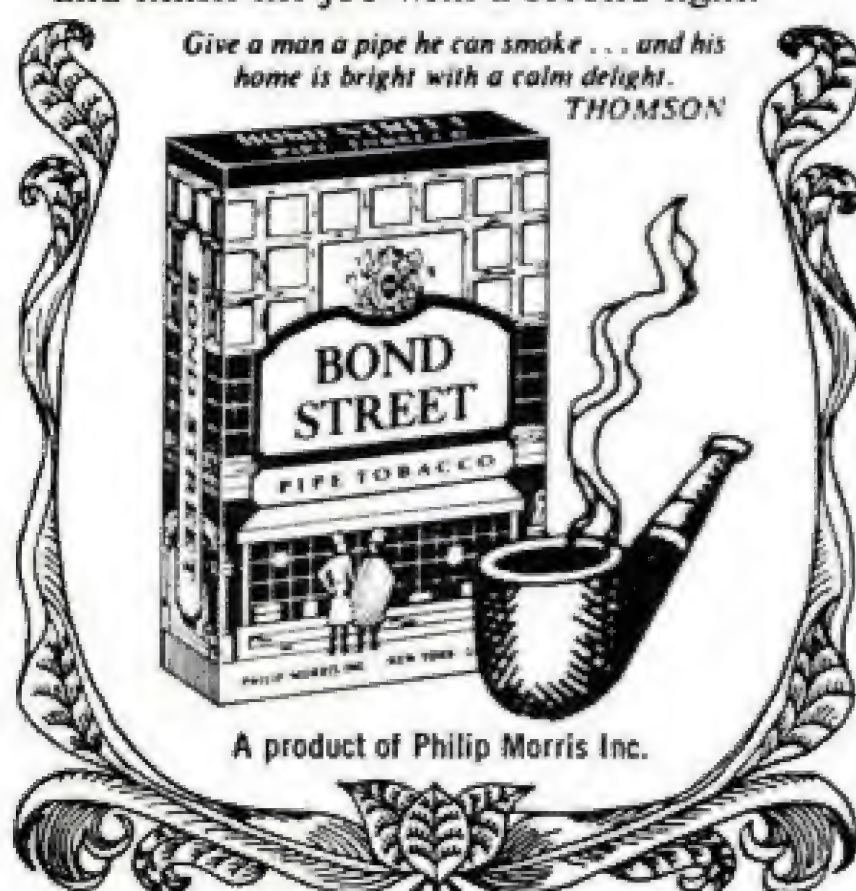
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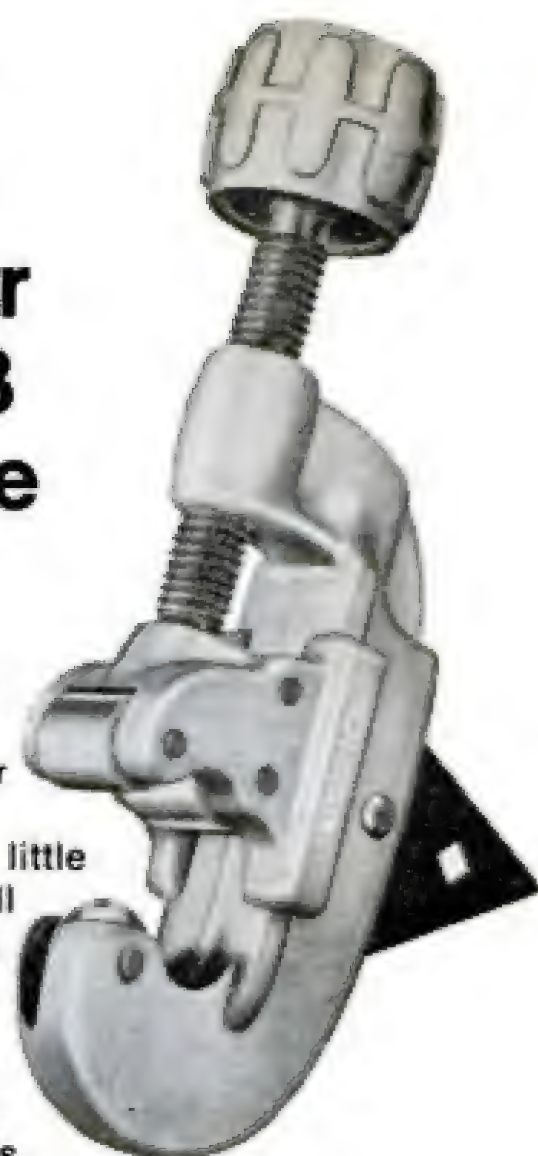
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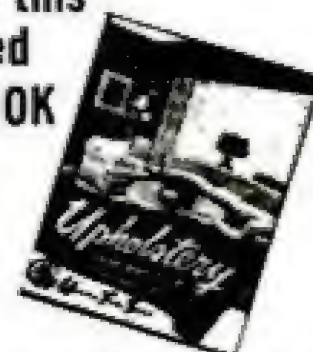
says C. J. Stempinski — 1121 Bonnie La., Madison, Wisc. "My shop is a two car garage I built with spare-time earnings while learning and another three months profits paid for the new Chevy Van Truck I just bought.

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## CHANGING FOOTBALL

*(Continued from page 248)*

football shoe, then throw it down.

It worked, until one game between the Bears and the now-defunct Brooklyn Dodgers. Three times in the press box, Johnsos saw a weakness in the Brooklyn defense, jotted down a play, and threw the paper-wrapped cleat down to his messenger. Each time, the Bears scored a touchdown. By that time, the Brooklyn fans had put cause-and-effect together and when Johnsos tried it for the fourth time, the air was filled with pieces of paper fluttering down. The Bear messenger never did find the cleat.

To overcome this problem, the Bears installed a telephone at the elbow of each coach in the press box. This was the era when telephone technology was improved swiftly due to the urgencies of World War II. In fact, Johnsos and the Bears gave it considerable impetus with a performance against the Green Bay Packers. The Bears were losing 6-0 in the second quarter when Johnsos turned to Lee Joannes, then president of the Packers, "Want to see a touchdown, Lee?" asked Luke. Joannes scoffed. So Johnsos picked up the phone at his elbow and whispered something like: "South Ray, 28 Flip-O pass, X-2-L swing up." On the next play the Bears scored a touchdown. A little later, Luke turned to Joannes and said, "Want to see another touchdown, Lee?" Joannes scowled. "You can't be that lucky twice!" Johnsos reeled off another series of figures and the Bears scored another touchdown. He picked up the phone a third time and turned towards Joannes again. "What about it, Lee? Another touchdown?" Joannes tore up his program and left the press box—while the Bears went on to score again and win, 38-7.

A month later, when the Bears lost to the Washington Redskins, 14-6, in the title game in Washington, Johnsos received a telegram from Joannes that read:

**"WHAT'S WRONG? TELEPHONE OUT OF ORDER?"**

Actually, the phone wasn't out of order. But owner George Marshall of the Redskins had shrewdly developed a counter-play. He'd stationed the Redskin band right behind the Bear bench. Every time he saw Johnsos reach for the phone, he'd reach for his telephone—which was connected with the bandstand—and order the noisiest number in the repertoire. The din was the first line of defense against the Bears' spy-in-the-sky.

It took a few years—and a power failure at Notre Dame—before the next step forward, electronically speaking. The

change was given momentum during the 1961 football season by Ara Parseghian, then grid coach at Northwestern. For a long while, Parseghian had been irritated over the fact that when Northwestern went on the road it invariably received a short line for its telephone connections i.e., a cable that was only about six feet long. "That meant you had to stay within six feet of the phone on the bench if you wanted to talk to the guy in the press box," Parseghian told me. To Parseghian, that was like a chain. He is an intensely visceral man who likes to roam up and down the sidelines, twisting and turning like a man in a hair shirt. He's also a man who believes in meticulous preparation. So he arranged for Northwestern to buy a walkie-talkie system to augment the telephone. With battery-powered walkie-talkies, he could range as far along the sidelines as he chose and still be in contact with his spy-in-the-sky.

### **Power fails Irish**

For a while, this was largely overlooked. Then, in 1961, Northwestern went to South Bend to battle Notre Dame. The game was an important one: Northwestern had never lost to Notre Dame under Parseghian's leadership. But by the fourth quarter of the 1961 game, Northwestern was losing—10-6. Then suddenly the power in the Notre Dame stadium failed. The lights on the scoreboard flickered off. The public-address system went off the air. Most important of all—to the coaches and players—the telephones between the press and the bench went dead. Notre Dame was blacked out.

But Ara Parseghian had his walkie-talkies and they relied on batteries. For seven minutes while the power was off, Northwestern marched purposefully down the field. With their communications working full tilt, a play came down from the Northwestern press box: The Notre Dame defense was reacting to the passing of the quarterback by dropping back to cover potential receivers, but they would abandon the receivers and come up fast to cut off a running play when a halfback carried the ball. Why not set up a play in which the quarterback faked a pass and gave the ball instead to the halfback—who would throw a pass as soon as the defense closed in on him? Parseghian had the play ready. It worked for the touchdown that beat Notre Dame, 12-10. "The radios helped," Parseghian said. "No doubt about it."

When all these devices are considered, the main thrust of the new technology of football is in two directions: (1) to get the

*(Please turn to page 252)*



# Un, deux, trois...


**That's how Autolite-equipped Fords finished in the 24-hour race at Le Mans, France: 1, 2, 3.**

The famous French long-distance race had an American accent this year. A U.S. car not only won the 24-hour race for the first time, but two more finished second and third. All three were Autolite-equipped Ford GT-40 Mark II sports racers. Sacre bleu! You could almost hear traditions shattering. But at Autolite we make a habit of helping shatter old ideas, of breaking new trails. So it's not surprising that the winning Le Mans Fords used complete Autolite ignition systems—including Autolite spark plugs, wire and cable, batteries, and alternators. We helped pioneer the successful rear engine racing car at Indianapolis. (We also introduced spark plugs with the exclusive Power Tips that clean themselves while you drive. And vibration-guarded batteries with sturdy reservoirs to minimize damage through water loss.) We like riding with winners, something Autolite products have been doing a lot lately. Why don't you go with Autolite, too? You're always right with Autolite.





# Had your teeth checked lately?



Saw teeth need regular check-ups, too. If you've got some old saws hanging around your basement, you can bet they're ready for a visit with a Nicholson or Black Diamond file.

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Burs • Hacksaw and Band Saw Blades • Hole  
Saws • Ground Flat Stock • Industrial Hammers

## NICHOLSON



## CHANGING FOOTBALL

*(Continued from page 250)*

information gathered by the assistant coaches in the press box transferred to the head coach on the side lines, and (2) to get the proper signal or play-call into the game so the quarterback can use it.

In recent years, there have been many devices used by the assistant coaches in the press box to supplement telephones and walkie-talkies in transferring information to the bench. On the theory that one picture is worth a thousand words, some teams used Polaroid cameras that produce prints in a matter of seconds. The print is then sent by messenger to the bench or filed for use at the halftime strategy session in the locker room.

Other coaches—among them Richard "Doc" Urich, now head coach at the University of Buffalo—tried simultaneous paper transmission, similar to the techniques used by some airlines reservation desks. They'd sketch out a play with "Xs" and "Os" in the press box and the sketch would be duplicated on similar paper in a machine on the bench.

But by far the most useful and flexible device is closed-circuit TV, preferably with an instant-replay device tied to it. This system allows the head coach to see the game from the vital overhead perspective while still remaining close to his players at field level. And the instant-replay equipment gives the coach a chance to stop action at any point on any play to determine exactly what happened.

### TV wins again

Last season, Texas was losing to Arkansas 20-0 after the first 19 minutes of play. Then—using information taken off a small Japanese-made video-tape unit—Texas quarterback Marv Kristynik began picking apart the Arkansas defense with counterflow passes (passes going counter to the flow of action), sent Texas' runners up against the sagging Arkansas middle—"we noticed on video tape that the Arkansas tackles were rushing to the outside, leaving a gap up the middle"—and drove Texas through an astonishing rally that gave the Longhorns a 21-20 lead. Unfortunately, it was not enough. Arkansas staged its own rally, won the game 27-24, then went on to exploit a video-tape system of its own.

Texas Tech had an even more enlightening experience with video tape last year. A past president of the Red Raiders, the school's booster organization, made \$25,000 worth of Ampex equipment available to the football team. Two video-

*(Please turn to page 255)*



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## Painful hemorrhoids?

All too often, humans who sit and stand pay the price of vertical posture. Sitting and standing combine with the force of gravity to produce extra pressure on veins and tissues in and around the rectal area. The result may be painful, itching or burning hemorrhoids.

The first thought of hemorrhoid sufferers is to relieve their pain and discomfort. However, of the products most often used for hemorrhoids, some contain no pain-killing agent at all...others have one too weak to provide necessary relief...and still others provide only lubrication.

Now at last there is a formulation which *concentrates on pain*. It actually has over 8 times more pain-killing power than the topical anesthetic most commonly used in hemorrhoid remedies. 8 times the power to ease the itching, pain, and burning of hemorrhoids.

The name of this product is Nupercainal. Nupercainal starts to work *on contact*. Provides *prolonged* relief from pain. Soothes and lubricates.

When you suspect you have hemorrhoids, check with your doctor. If hemorrhoids are the cause of your discomfort, chances are he'll recommend Nupercainal.

Nupercainal is available without prescription at professional pharmacies everywhere. Ask for ointment or new suppositories with free pocket-pack. (Say New-per-cane-all.)

### Nupercainal®

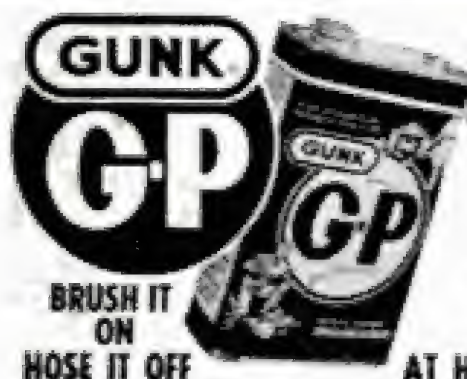
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ARROW T-50

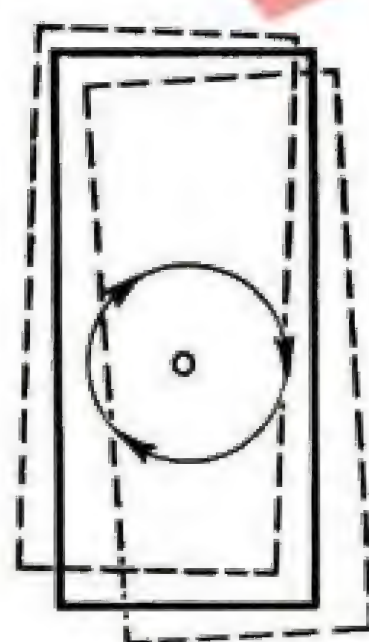
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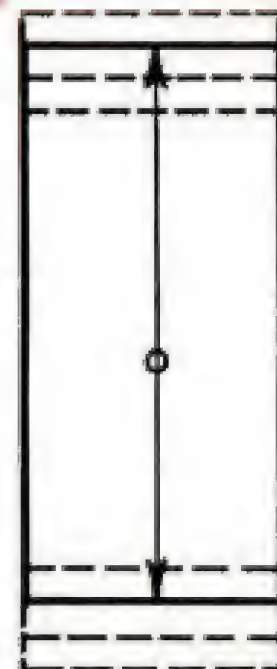
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**FINGERTIP SELECTION** of either fast-cutting orbital or fine-finish straight-line action makes the new Wen Model 320 a versatile tool for the home shop. For rough sanding, you get 4200 orbital strokes a minute; then, when you're ready for finish smoothing, you touch a lever and the sander converts for 9000  $\frac{1}{16}$ -in. straight

strokes per minute. Although convertibility has been a feature of other makes, this is the first time we've seen it offered on an industrially-rated sander for under \$28. We also liked the quick-change, lever-type sandpaper clamp—although it requires a specially shaped tab on each end of the  $3\frac{5}{8}$  x 9-in. sheet.

## Sand at any speed

**YOU CAN'T BUY** GE's new variable-speed sander—you "create" it. The sander is only one of four heads that clap onto a single power unit, as described on page 50, Sept., '65 *PM*. But GE's just introduced a trigger-squeeze speed control into its power unit, and you can buy it as a  $\frac{1}{4}$  or  $\frac{3}{8}$ -in. drill or saber saw, and then buy the sander as an extra head. The sander is also included in the "complete variable-speed workshop" in a metal case for \$64.98.





## CHANGING FOOTBALL

*(Continued from page 252)*

tape recorders and TV screens were set up in the press box with two Texas Tech assistant coaches assigned to run them. A third set was on the bench where the players and other coaches could gather to get an "overhead" view of the game—and of the opponent's defensive spacing and reaction. Texas Tech used the system against Kansas and won. But it didn't use the system against Texas—it was too bulky to take on the road—and they lost.

Tech decided it didn't want to be caught again. So when it went to play Texas A & M, it brought the video-type equipment along, bulk or no bulk. It didn't seem to help early in the game. In the third quarter, Texas Tech was trailing 10-0. Coaching staff and team members clustered around the video screens on the sidelines, watching instant playbacks. They quickly noticed a pattern: Texas A & M line backers were coming up fast to stop Tech's celebrated halfback, Donny Anderson. Coach J. T. King decided to throw out half the team's offense, and concentrate on using just nine different plays. He ordered quarterback Tom Wilson to fake a hand-off to Anderson and throw a pass to an end. The play worked, then worked again later in the third quarter. Still exploiting video-tape, King guided Tech's fourth-quarter strategy. The result: Tech came from behind, then went on to win, 20-16. The usefulness of the new technology was hailed by King: "You discover instantly the things that usually would not turn up until you looked at the game film on Monday."

Actually, the days of closed-circuit TV and instant-replay devices may be numbered. The Big Ten has barred their use at all conference games. And last spring the Athletic Association of Western Universities—the revision of the old Pacific Coast League—similarly barred their use.

The other direction in the technology of football—communicating signals and plays from the bench to the quarterback on the field—has varied from the primitive to the exotic. Paul Brown, long-time coach of the Cleveland Browns, sent in instructions via a substitute player on every play of the game, as did many others. Ara Parseghian and his long-time assistant at Northwestern, Alex Agase (now head coach at NU), worked out a system of whistles, grunts and shouts to Northwestern's players on the field.

Back in 1949, when the Philadelphia Eagles were on their way to their second straight NFL title, coach Greasy Neale

*(Please turn to page 256)*



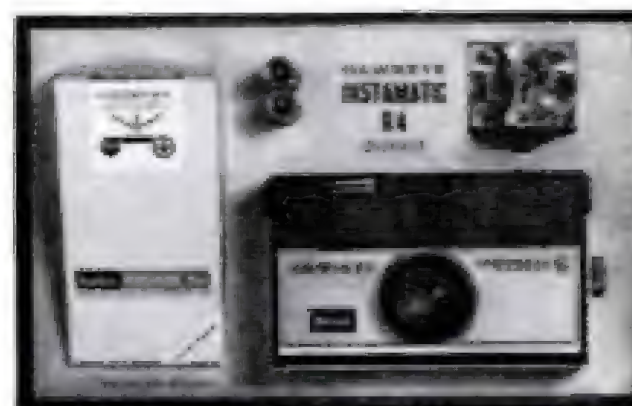
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## CHANGING FOOTBALL

(Continued from page 255)

sat on the bench and entertained the fans with his cavalier disregard of the opposition by reading a newspaper. Then one day Walter Halas, acting in his role as chief scout for the Chicago Bears, became interested in Greasy's newspaper. "Hey, isn't that paper moving in patterns—up and down, to the right and left?" he asked an aide. It sure was. So Halas began charting the Philadelphia plays after Greasy moved the paper in a particular pattern. By game's end, he had the patterns down cold, and the Bears spent the next week teaching them to their defensive team. On the next Sunday, the Bears went into the Philadelphia game as 12-point underdogs. They emerged as 17-point victors. And all because Greasy was signaling 80 percent of his plays with the *Philadelphia Inquirer*.

Naturally it was only a matter of time before somebody decided to try to send signals by radio. One of the earliest and most-publicized of such incidents involved Paul Brown. In 1956 he decided to mount a tiny radio receiver in the helmet of his quarterback, George Ratterman, who tried it in a couple of exhibitions.

For a while the idea all but panicked the NFL. (Ultimately, the league was to issue an edict barring the use of radio transmitters.) But there have long been smothered reports in the NFL that the New York Giants reacted much more ingeniously to the threat. According to these reports, the Giants acquired an ex-Browns player named Gene Filipski. He insured them a pretty good understanding of the code names the Browns used for their plays. Then they figured the Browns could only be using one of three radio frequencies authorized by the Federal Communications Commission for "public" use. They set up their own radio-interception equipment on the Giant bench and turned to these frequencies. Filipski listened in to see if he could hear the orders issued from across the field by Paul Brown. He could. The Giants intercepted four Cleveland passes and ran up 256 yards by rushing, to Cleveland's 40. According to reports, the Browns suspected that they were being overheard and abruptly went off the air. But not until the Giants were on their way to a 21-9 victory. It was the key win in a year in which the Browns were dislodged from a divisional championship for the first time since they entered professional football.

At a game last year in Dearborn, Mich., an assistant coach of Fordson High School



sent down instructions to the bench through a walkie-talkie—and winced when he heard the message suddenly and inexplicably boom out over the public-address system. That same night, at a game between Henry Ford and MacKenzie High School in Detroit, both teams found that they were sending plays to the bench on the same frequency.

### Human mind triumphs

In the long run, the most cunning counter to electronic technology in football is the human mind. In 1947, the Chicago Cardinals were about to meet the Philadelphia Eagles in the championship game of the NFL. It was a cold, blustery day and the gridiron was a frozen crust. In their locker room before the game, the Cardinals were dutifully changing from their thick-cleated football shoes to rubber-soled sneakers (by then it was customary to wear sneakers on frozen turf). Suddenly a clubhouse boy came bursting into the Cardinal locker room. "The Eagles are filing their cleats to points!" he reported breathlessly.

"They can't do that," cried Ray Bennigsen, then president of the Cardinals. "It's illegal. I'm going to report them!"

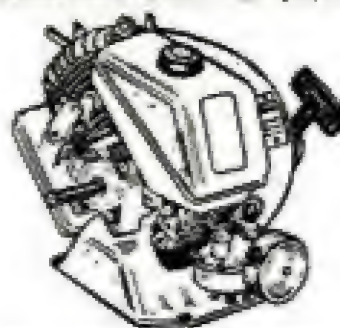
Jimmy Conzelman, gifted coach of the Cardinals, intercepted him at the door. "Tut-tut!" he murmured soothingly. "No use worrying the commissioner over this."

Not long after the kickoff, Philadelphia got off a good gain. Suddenly, a member of the Cardinals was calling for a referee and pointing towards the feet of a Philadelphia ballplayer, apparently indignant over the fact that the Philadelphian was wearing illegal equipment. The referee took a look at the cleats, and saw that they'd been filed down. He nullified the gain, penalized the Eagles five yards and sent the player off the field to get legal equipment. A little later, Philadelphia reeled off another good gain. Again the Cardinals asked the referee to check the cleats of an Eagle. Again the play was nullified and Philadelphia was penalized and the player left the field. When it happened a third time, Greasy Neale of the Eagles got the message: Conzelman intended to have the infraction called player-by-player, selecting the best Philadelphia gains and having them called back for illegal equipment. No telling how many potential touchdowns might be called back! So Neale called a time out and there was a mass changing of cleats.

The Cardinals went on to win the game and the championship. And the mind of man—which had created the most humble and most exalted of technology—had triumphed once again. ★ ★ ★

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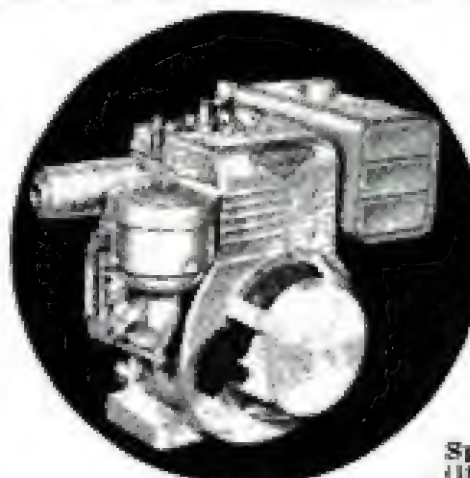
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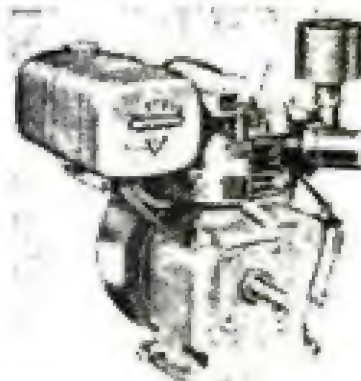
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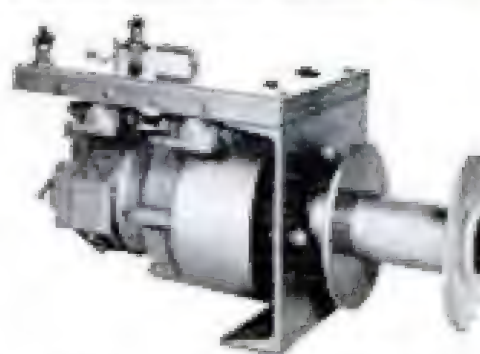
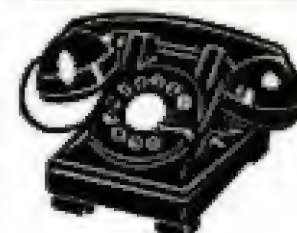
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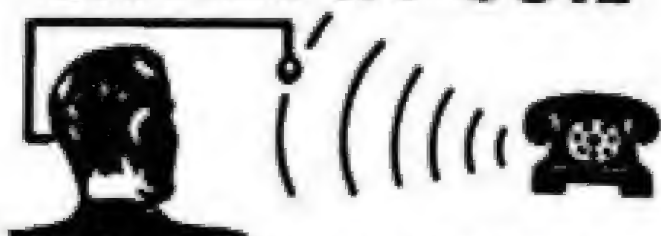
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## THE CALMER COMPACTS

(Continued from page 113)

appearance of the '67 Corvairs is essentially unchanged. Not only that, but the turbocharged engine and four-carburetor unit have been discontinued as well.

**DART:** The heavy weight of success gives Dart something of a spread: it's got almost two inches wider front track, another inch of overall width, and it's an inch lower than last year. And on top of that, it looks a lot different, but the sporty look is still the keynote. The only thing happening under the hood is a boost in horsepower for the 170-cu.-in. engine. It's up from 101 to 115 using the same camshaft as the 145-hp, 225-cubic-inch Six.

**FALCON:** Trifles ignored, Falcon has the pseudo-Mustang styling it had last year, but that's not to put it down. If you like a little bit of sport without the severity of the Mustang line, here's your car. When it comes to figuring out the "standard, optional and not available" in the power train charts, it helps to have studied some mathematical combinations and permutations theory. But briefly, the 200-cu.-in. Six has become standard on the Futura club coupe and four-door sedan, and the 289-cu.-in., 4-barrel V8 is a new addition to options in the Falcon line-up.

**VALIANT:** The Valiant for '67 could very well be the sleeper of the year—and that's speaking from the styling viewpoint alone. Entirely retooled sheet metal from roof to rocker panel has resulted in a body line that's got more class than you could hope to expect in exchange for so few dollars.

Standard engine in the V-100 series is the 170-6, and in the Signet series, the 225-6. Both engines are claimed to be more efficient due to combustion chamber reshaping, and more economical in fuel consumption due to lower axle ratio. We'll let a future *PM Owners Report* confirm or refute the boast.—Bill Hartford

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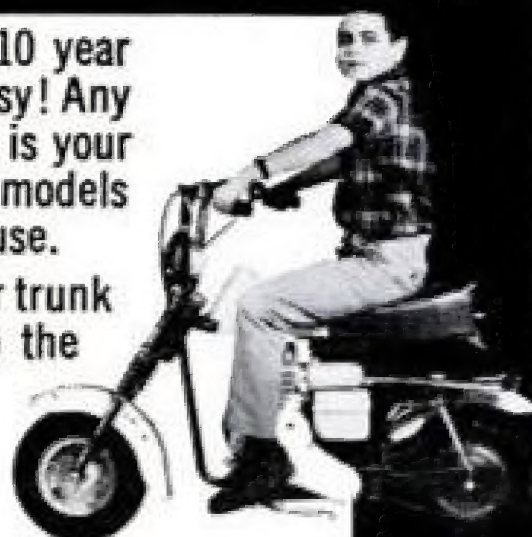
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Mason  
Painting Contractor  
Reading Arch. Blueprints  
Review in Arch. Design &  
Practice  
Review of Mech. Systems  
in Buildings

## ART

Amateur Artist  
Commercial Art  
Commercial Cartooning  
Interior Decorating  
Oil Painting for Pleasure  
Show Card & Sign Prod.  
Show Card Writing  
Sign Painting & Designing  
Sketching & Painting

## AUTOMOTIVE

Automatic Transmission  
Specialist  
Automobile Body Rebuilding  
& Refinishing  
Automobile Electrical Tech.  
Automobile Engine Tune-Up

Automobile Technician  
Automotive Mechanic  
Diesel-Gas Motor Vehicle  
Engines

## BUSINESS

Advertising  
Basic Inventory Control  
Business Administration  
Business Management &  
Marketing  
Business Management &  
Production  
Canadian Business Courses  
COBOL Programming  
Condensed Business  
Practice  
Direct Mail & Mail Order  
Advertising  
Industrial Psychology  
Magazine & Newspaper  
Advertising  
Managing a Small Store  
Marketing  
Marketing Research  
Modern Executive  
Management  
Office Automation  
Office Management  
Programming for Digital  
Computers  
Programming the IBM 1401  
Computer  
Purchasing Agent  
Retail Business  
Management  
Retail & Local Advertising  
Retail Merchandising  
Retail Selling  
Systems and Procedures  
Analysis

## CHEMICAL

Analytical Chemistry  
Chemical Engineering  
Chemical Engineering Unit  
Operations  
Chemical Laboratory Tech.  
Chemical Process Operator  
Elements of Nuclear Energy  
General Chemistry  
Instrumental Laboratory  
Analysis

## CIVIL ENGINEERING

Civil Engineering  
Construction Engineering  
Highway Engineering  
Principles of Surveying  
Reading Highway Blueprints  
Sanitary Engineering  
Sewage Plant Operator

Structural Engineering  
Surveying and Mapping  
Water Works Operator

## DRAFTING

Architectural Drafting  
Design Drafting  
Drafting Technology  
Electrical Drafting  
Electrical Engineering  
Drafting  
Electronic Drafting  
Introductory Mechanical  
Drafting  
Mechanical Drafting  
Pressure Vessel and Tank  
Print Reading  
Sheet Metal Layout for  
Air Conditioning  
Structural Drafting

## ELECTRICAL

Electric Motor Repairman  
Electrical Appliance  
Servicing  
Electrical Contractor  
Electrical Engineering  
(Power option or  
Electronic option)  
Electrical Engineering Tech.  
Electrical Instrument Tech.  
Industrial Electrical Tech.  
Power Line Design and  
Construction  
Power Plant Operator  
(Hydro or Steam Option)  
Practical Electrician  
Practical Lineman  
Reading Electrical  
Blueprints

## ENGINEERING (Professional)

Chemical Civil  
Electrical Mechanical  
Industrial Management for  
Engineers

## ENGLISH AND WRITING

Better Business Writing  
Free Lance Writing  
Introductory Tech. Writing  
Modern Letter Writing  
Practical English  
Short Story Writing

## HIGH SCHOOL

High School Business  
High School (Canada)  
High School College Prep.  
(Arts)  
High School College Prep.  
(Engineering & Science)

High School General  
High School Mathematics  
High School Secretarial  
High School Vocational

## LANGUAGES

(Edited by Berlitz)  
French German  
Italian Spanish

## LEADERSHIP

Basic Supervision  
Industrial Foremanship  
Industrial Supervision  
Personality Development  
Personnel-Labor Relations

## MATHEMATICS

Advanced Mathematics  
Mathematics and Mechanics  
for Engineering  
Mathematics and Physics  
for Engineering  
Mathematics & Physics for  
Technicians  
Modern Elementary  
Statistics

## MECHANICAL

Aircraft & Power Plant  
Mechanic  
Industrial Engineering  
Industrial Instrumentation  
Machine Design  
Mechanical Engineering  
Quality Control  
Safety Engineering Tech.  
Tool Design  
Value Analysis

## PETROLEUM

Natural Gas Production &  
Transmission  
Oil Field Technology  
Petroleum Production  
Petroleum Production  
Engineering  
Petroleum Refinery Oper.  
Pipeline Engineering

## PLASTICS

Plastics Technician

## PLUMBING, HEATING, AIR CONDITIONING

Air Conditioning  
Air Conditioning Maint.  
Domestic Heating with  
Oil & Gas  
Domestic Refrigeration  
Heating  
Heating & Air Conditioning  
with Drawing  
Industrial Air Conditioning

## Industrial Heating

Plumbing  
Plumbing & Heating  
Practical Plumbing  
Refrigeration  
Refrigeration & Air  
Conditioning  
Steam Fitting

## PULP AND PAPER

Paper Machine Operator  
Paper Making  
Pulp Making  
Pulp & Paper Engineering  
Pulp & Paper Making

## SALESMANSHIP

Creative Salesmanship  
Real Estate Salesmanship  
Sales Management  
Salesmanship

## SECRETARIAL

Clerk-Typist  
Commercial  
Legal Secretary  
Medical Secretary  
Professional Secretary  
Shorthand  
Stenographic  
Typewriting

## SHOP PRACTICE

Drill Operator  
Foundry Practice  
Industrial Metallurgy  
Lathe Operator  
Machine Shop Inspection  
Machine Shop Practice  
Machine Shop Practice &  
Toolmaking  
Metallurgical Engineering  
Technology  
Milling Machine Operator  
Multicraft Maintenance  
Mechanic  
Practical Millwrighting  
Reading Shop Prints  
Rigging  
Tool Engineering Techn'y  
Tool Grinder  
Toolmaking  
Turret Lathe Operator  
Welding Engineering Tech.

## STEAM AND DIESEL POWER

Boiler Inspector  
Industrial Building  
Engineer  
Power Plant Engineering  
Stationary Diesel Engines  
Stationary Fireman  
Stationary Steam Eng.

## TEXTILES

Carding  
Carding and Spinning  
Dyeing & Finishing  
Loom Fixing Spinning  
Textile Designing  
Textile Technology  
Textile Mill Supervisor  
Warping and Weaving

## TRAFFIC

Motor Traffic Management  
Railway Rate Clerk  
Traffic Management

## TV-RADIO- ELECTRONICS

Communications Techn'y  
Electronic Fundamentals  
Electronic Fundamentals  
(Programed)  
Electronic Fundamentals  
with Electr. Equip. Tr'n'g  
Electronic Instrumentation  
& Servo Fundamentals  
Electronic Principles for  
Automation  
Electronics and Applied  
Calculus  
Electronics Technician  
First Class Radiotelephone  
License  
Fundamentals of Electronic  
Computers  
General Electronics  
General Electronics with  
Electronic Equip. Tr'n'g  
Hi-Fi Stereo and Sound  
Systems Servicing  
Industrial Electronics  
Industrial Electronics  
Engineering  
Industrial Electronics  
Engineering Technician  
Practical Radio-TV Eng'g  
Practical Telephony  
Principles of Radio-  
Electronic Telemetry  
Principles of Semiconduc-  
tor-Transistor Circuits  
Radio Servicing with  
Equipment Training  
Radio & TV Servicing  
Radio & TV Servicing with  
Equipment Training  
Second Class Radiotele-  
phone License  
Sound Systems Specialist  
Telephony, Electronics and  
Radio Communications  
TV Receiver Servicing  
TV Technician

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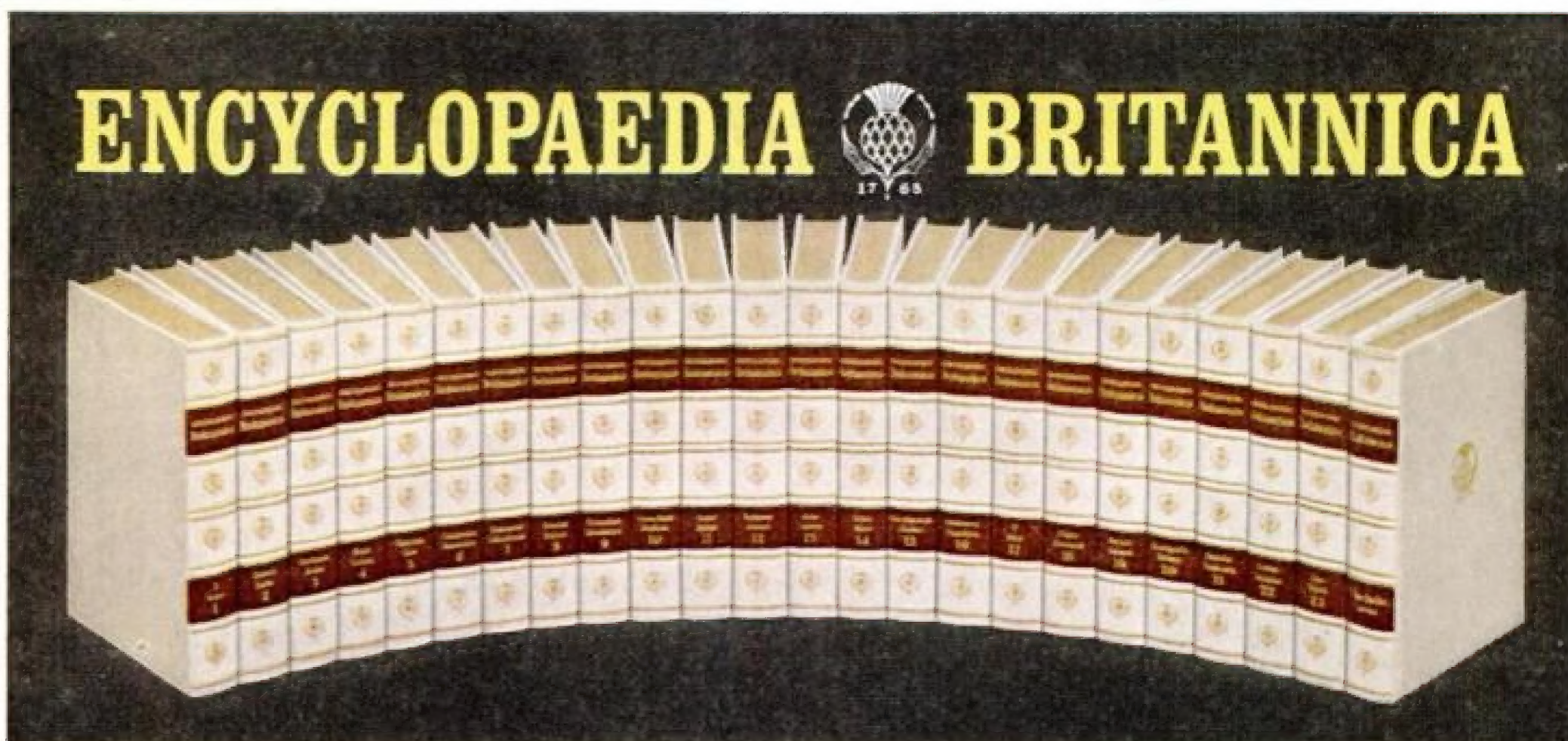


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